SPECIAL (INGREDIENTS OF A CUBIC YARD OF CONCRETE AND THE COST.—By L. C. SABIN, U. S. Asst. Engineer.

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INGREDIENTS OF A CUBIC YARD OF CONCRETE, AND THE COST.*

By L. C. Sabin, U. S. Asst. Engineer.

7. In a previous article we considered the amount of cement and sand required for a cubic yard of cement mortar; it is but another step to determine the materials requisite for a yard of concrete. The rules given for determining the proportions of ingredients to use in concrete are not all to be commended, and while this article is concerned chiefly with the quantities of materials required when the proportions have been decided upon, we may suggest briefly the principle which should underlie the determination of these proportions.

8. Concrete is simply a class of masonry in which the stones are small and of irregular shape. The strength of the concrete is largely dependent upon the strength of the mortar; in fact, this dependence will be much closer than in other classes of masonry, since it may be stated, as a general rule, that the larger and more carefully cut are the stone, the less will the strength of the masonry depend on the strength of the mortar. In deciding, then, upon the proportions of ingredients to use in a given case, the quality of the mortar should first be considered. If the concrete is to be subjected to a moderate compressive stress, the mortar may be comparatively poor in cement; but if great transverse strength is required, the mortar must be of sufficient richness; while, if the concrete is to be impervious, the mortar must possess this quality as well.

9. In making concrete the general rule should be that enough mortar be used to just fill the voids in the stone. If either less or more mortar than this amount be employed the concrete will in general be weakened thereby. This last statement is subject to one exception: If the mortar becomes stronger than the stone then an excess of mortar does not weaken the concrete; this case, however, should never be permitted to occur, the aggregate used should have a strength at least equal to that required of the concrete. It is a simple matter then to determine the required amount of mortar for a given volume of broken stone or aggregate, and the amount of cement and sand for a given volume of mortar has already been considered.

10. The bulk or volume of a given mass of broken stone is not so variable a quantity as the volume of sand. The volume of the aggregate will vary considerably with the degree of packing, but the packing is not influenced ap-

*See "Ingredients of a Cubic Yard of Mortar, and the Cost," in MUNICIPAL ENGINEERING, February, 1899.

preciably by the amount of moisture present. The percentage of voids in the aggregate may be determined as follows: Obtain the weight per cubic foot of the broken stone in the condition in which the percentage of voids is sought. Also obtain the specific gravity, and hence the weight per cubic foot, of the *solid* stone. Then one, less the quotient obtained by dividing the weight per cubic foot of the broken stone by the weight per cubic foot of the solid stone will be the proportion of voids in the former. Another method is to fill a vessel of known capacity with the aggregate to be used, and to pour in a measured quantity of water until the vessel is entirely filled. The volume of water used indicates the necessary quantity of mortar. In using this method the stone should be moistened before placing in the vessel to avoid an error from the absorption of the water used to measure the voids.

11. As to the degree of jarring or packing to which the stone should be subjected in filling, if the stone is put in loose, and it is proposed to ram the concrete in place, the amount of mortar indicated will be somewhat more than the required quantity; if the concrete is to be deposited without ramming (as in submarine construction), the amount of mortar indicated will not be too great. On the other hand, if the aggregate is shaken down in the vessel to refusal, the voids obtained will be less than the amount of mortar which should be used, because it is not possible to obtain a perfect distribution of mortar in a mass of concrete, such that the concrete will occupy only the same space as did the broken stone when thoroughly shaken. And again, for perfect concrete, pieces of stone should be separated one from another by a thin film of mortar, and hence the volume of the concrete will be greater than the volume of the aggregate measured in compact condition without mortar. A deficiency of mortar is usually more detrimental than an excess. It is, therefore, safer to measure the voids in the stone when but slightly jarred and make the amount of mortar correspond to the voids so obtained.

12. We may say, then, that the rational method of proportioning concrete is to let the duty required of the concrete fix the quality of the mortar, and let the quantity be sufficient to fill the voids in the aggregate. Knowing the percentage of voids in the aggregate, and consequently the percentage of mortar which should be found in a cubic yard of the finished concrete, we may obtain the approximate cost per cubic yard of the latter for a given quality of mortar and given unit prices.

Thus, suppose we have stone in which the voids are such that the mortar will amount to 40 per cent. of the finished concrete, and we wish to have the mortar composed of two parts sand to one part natural cement, by weight, unit prices being as follows:

Cement, $1.30 per bbl. of 300 pounds, net.
Sand, .30 per cubic yard.
Stone, 1.25 per cubic yard.

As in paragraph 6 (February number), we find the ingredients in one cubic yard of mortar to cost $4.36. Since 40 per cent. of the concrete is to be mortar the mortar in one cubic yard of concrete will cost 40 per cent. of $4.36, or $1.75, and one yard of stone at $1.25 will make the total cost of the materials in the concrete $3 per cubic yard.

13. Diagram No. 3 may be used to get the approximate cost of the

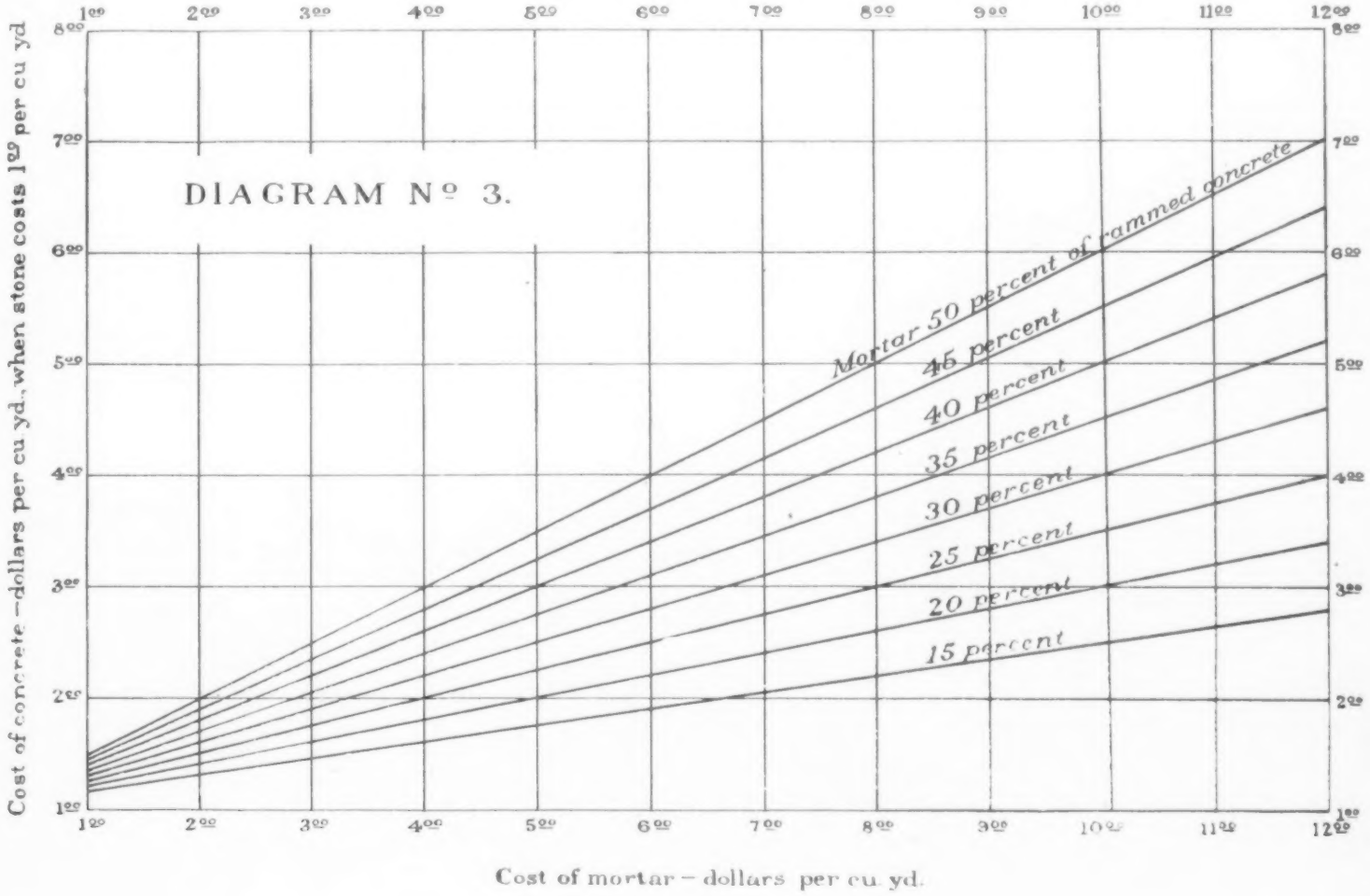


DIAGRAM Nº 3.
Mortar 50 percent of rammed concrete
45 percent
40 percent
35 percent
30 percent
25 percent
20 percent
15 percent
Cost of concrete – dollars per cu yd, when stone costs 1$ per cu yd
Cost of mortar – dollars per cu. yd.
1$ 2$ 3$ 4$ 5$ 6$ 7$ 8$ 9$ 10$ 11$ 12$
8$ 7$ 6$ 5$ 4$ 3$ 2$ 1$

concrete after having obtained the cost of the mortar from either diagram 1 or 2. Thus, if we enter diagram 3 with cost of mortar $4.36, and follow the abscissa to the diagonal line marked 40 per cent., we find this to be on the ordinate $2.75, the cost of the ingredients in a cubic yard of the concrete when the stone costs $1 per cubic yard. Hence, $2.75 plus $.25= $3, the approximate cost of the materials in a cubic yard of the finished concrete as desired. The qualification "approximate" is used advisedly, because it is well known that since the amount of concrete made from given quantities of ingredients is subject to slight variation from so many causes, accurate estimates of cost are not possible.

14. The usual method, however, of stating proportions in concrete is to give the volume of sand and stone to one volume of cement. Thus, one of cement, three of sand and six of stone, would usually mean one volume of packed cement, three volumes of loose sand and six volumes of loose broken stone. When proportions are thus arbitrarily stated, we may determine, from the tables and diagrams already given, the amount of water which a given quantity of dry ingredients will make, and the consequent cost of the mortar per cubic yard. Then a knowledge of the voids in the broken stone will permit of a close estimate of the amount of concrete made, whence the cost of the latter.

For example, suppose it is desired to determine the cost of materials in a cubic yard of natural cement concrete under the following conditions:

One bbl. cement containing 280 pounds net at $1 per bbl.
Three bbls. sand weighing 100 pounds per cu. ft. at $0.75 per cu. yd.
Six bbls. loose broken stone having 45 per cent. voids at $1.25 per cu. yd.

1 bbl. cement = 3.75 cu. ft. = 0.139 cu. yd. cost	$1.000
3 bbls. sand = 11.25 cu. ft. = .417 cu. yd. cost	.313
6 bbls. stone = 22.50 cu. ft. = .833 cu. yd. cost	1.041
Total cost	$2.354

From table 2 (page 72) we find that it requires 2.03 barrels of cement to make one cubic yard of one to three mortar; then one barrel of cement would make 0.493 cubic yard. As 45 per cent. of the stone is voids the amount of solid stone in six barrels of broken stone would be $.833 \times .55 = .458$ cubic yard. Then the mortar plus solid stone would be $.493 + .458 = .951$ cubic yard. It has been found by experiment that the amount of concrete made will usually exceed the sum of the mortar and solid stone by from two to five per cent., hence we may assume in this case that .98 cubic yard of concrete resulted from the above materials and $2.354 \div .98 = \$2.40$, the cost of the material in one cubic yard of finished concrete. To obtain the actual cost of concrete in place, the cost of mixing and deposition must be added.

LANDSCAPE ENGINEERING.

By W. K. Eldridge, City Engineer of Lafayette, Ind.

The term "landscape engineering" is used in default of a better one, covering as it does so many and varying provinces. When choosing his profession, the future engineer is supposed to be governed by his recognized liking or aptitude for such work as a life work, by which he is to make his living; and one of the objects of this article is to show that the study and thorough knowledge of landscape design and management will tend to provide a welcome increment to his yearly income.

Landscape engineering in general terms may be held to include everything pertaining to the proper handling of the scenes of nature, with reference to their unsullied preservation, or artistic creation, for the benefit of mankind. Thus it often becomes diametrically opposed to the commonly accepted style of carrying out all engineering projects over and through all obstacles without regard to the future appearance of the work, which the ordinary training and experience of the civil engineer does nothing to restrain. The study of this art, therefore, in connection with the regular studies of an engineering course, can not fail to have a humanizing influence, an incentive toward a broad and liberal culture, no less important than is supposed to proceed from the literary part of a young man's education.

An important part of the work of a civil engineer is the laying out and platting of town sites and suburban additions. In addition to his knowledge of topography and drawing, he should have a thorough knowledge of the economical grading of both streets and lots, the preservation of trees and drainage lines, etc. The lots always command better prices when laid out according to the true principles of landscape art. Natural beauty has a distinct money value, and as society becomes more enlightened, this beauty will be valued more highly. The engineer, by incorporating all that is possible of this beauty in his scheme of platting, is conferring upon his clients the utmost value of his professional services.

The growth of cities, however, has usually been by a system of accretion, the original lay-out being on a small scale, often no more than a village; then the vacant lands surrounding became divided into smaller and smaller holdings, until platting into town lots began by individual holders, without any concert of action, or any attempt at conformity with nature or with each other. Our towns and cities must now be taken as they are, with all their defects, and the opportunities to design a large and complete city are very few; but the engineer will be often called upon to lay out large suburban towns and park-like additions adjacent to the more enterprising cities of rapid growth and extension, and these will call for the full exercise of all his powers.

In all our cities, except the very largest, the city engineer is apt, *ex officio*, to be put in charge of the public parks and grounds; and as our technical schools are now the incubators of the future incumbents of this important office, they

can not be too soon about helping their students to a well-grounded perception of what is right and proper in such cases. Too often the engineer will have turned over to him a work finished by well-meaning but wholly incompetent hands, and which he is expected to care for in its unfortunate integrity. He will have impressed upon him, as never before, the patent fact that self-satisfied ignorance in responsible places is always expensive to the public, in both the financial and the esthetic sense. He should attempt, with all due modesty and care, to correct, as fast as possible with the means at his command, the most glaringly visible defects, and make the best of a bad job. In other cases he will have turned over to him a virgin spot of ground, with great possibilities, and then will come the test of his self-abnegation and public spirit; for I conceive it to be his plain duty to urge upon his official board the employment of the most expert professional advice of a specialized nature to be procured, in the same manner and for the same reason that this is done in hydraulic and sanitary matters. Indeed, the expert should if possible be retained before the site of the park is secured, for the proper location and boundaries of a proposed park are not the least important matters connected with its establishment. The city engineer can be of the utmost value, if he already have a thorough knowledge of such matters, in rendering intelligent and sympathetic assistance to the expert in the preliminary work, and in the capable carrying out and supervision of the general design, which in its constructive details will necessarily be left to him. Hence the necessity of a broad training and a liberal education, beginning during his college term and continuing through life, coupled with a healthy development of a love for nature that, while it may be an acquired instinct, will infal-

WYANDOTTE STREET, KANSAS CITY, MO., PAVED WITH ASPHALT.

libly lead him to understand and appreciate the attainment of the best results. Otherwise a mere parody of the artist's ideal is to be expected, to the great detriment of the work and possible vitiation of the public taste.

But in the majority of cases, where the smaller cities and towns already possess their neglected preserves dedicated for the public pleasure, the city engineer or the town surveyor will be thrown upon his own unaided resources, and all will depend upon how these resources have been nurtured. Right here the engineer should re-remember that the bias derived from his ordinary technical education is on strictly utilitarian lines, with no incentive to harmonize his work with the landscape. Hence he should always be on his guard to give precedence to the necessities of the art questions involved, without bringing into prominence the means by which they are obtained. Yet this very same technical education makes the engineer the fittest person for undertaking and directing the varied work necessary to carry out the objects of the place.

The care and satisfactory management of public grounds is in some respects a more difficult work than their construction. The engineer in charge must often stand up against the people themselves, at the risk of his own personal popularity, to protect his charge from the thoughtless ravages of its owners, the public. What one person may do without appreciable damage, becomes death and destruction when done by the multitude, and the conscientious care-taker must administer his trust without fear or favor. His knowledge in the matter of thinning out and pruning the trees and shrubbery under his care should not be elementary, for there is no more baseless assumption than that any one knows how to cut down a tree, or what trees ought to be cut and what left standing.

Much can be done by city engineers to better the planting and care of the shade trees which border the streets of our cities and towns, often dragging out a precarious and unsightly appearance, when intended for the beautifying of the place. A thorough knowledge of soils, transplanting and pruning is requisite, especially the latter, as a check upon the ignorance and presumption of the professional pruner, whose ravages are sad to contemplate.

As time goes on, the advice of the engineer known to be capable of good landscape design will be sought more and more in the laying out of private grounds, both great and small. Too often the owner locates and builds his house, and, as if it were an afterthought, calls in the landscape designer when it is too late for him to afford his most valuable services. Thus the designer of the outside work is handicapped by many difficulties that would not have arisen if he had been consulted sooner. It seems strange that the architect, whom the owner summons first in the matter, should not realize that the help of his engineer cousin is as desirable here as when his assistance is sought in the more purely engineering features of constructive building. Perhaps one reason for this state of things is, that the engineer has not appreciated his opportunities sufficiently to lead him to fit himself for giving such assistance.

One great privilege of the landscape engineer is the intelligent direction of the desires of uninstructed wealth; for custom and indifference combine to blind the

eyes of the rich to the fact that they are prone to a display of wealth alone, while sincerely striving for beauty. While satisfied with their own vulgar ostentation, they are usually just as quick to see and appreciate the results of intelligent design and direction, if they can be induced to employ them. So, the more of such work of the proper character that is done by the engineer, the more he will obtain in the future.

The engineer can not fail to find a knowledge of scientific forestry, meaning the intelligent selection and preservation of trees, of the utmost value during his professional life. Not only will the delights of botanic and economic research be in the nature of a relaxation, but there will appeal to him as a citizen, as never before, the full realization of the infinite waste and wreck that have been perpetrated in our once grand forest domain. He will see the necessity for the protection of water supplies, fish and game; the dangers arising from the thoughtless stripping of the forest covers from the elevated sources of streams. The intelligent care of the forests in this age is one of the best evidences of civilization, and it is a fact that the true lovers of trees and the wisest managers of forests are found among the people who stand among the nations as the recognized leaders in every intellectual and moral movement, wherein we fondly imagine ourselves to take precedence. To clear away and burn up a piece of woods and plant corn is no evidence of such leadership, but quite the contrary. It is an encouraging sign of the times that our land-grant colleges are taking this subject up in earnest, and its importance is earnestly urged upon the student. The study of plant pests and their control, as undertaken by the government experiment stations, is of the utmost value in this connection.

ASPHALT OVER OLD COBBLESTONE PAVEMENT, COLUMBUS, OHIO.

The engineer's training in the art of drawing gives him, of course, an important advantage in landscape work, if he will be careful to put aside any preconception that

the drawing controls the work, in the sense that this is true in the case of bridges, railways, etc. The elaboration of drawings with a thought of its effect on paper, instead of merely as a means to an end, may lead the designer into grave errors of taste and cast reproach upon his work.

It may fairly be said that nothing, even of the most utilitarian character, can be an offensive feature of the landscape, when properly worked in and incorporated by a designer of insight and training. A great mill, a brewery, or a coal dock have from their extent and mass a certain dignity, often worthy, when rightly displayed to the view of more than a passing glance. The treatment of rivers and their banks, dams and hydraulic works, helps to navigation and the control of freshets, all in themselves purely engineering problems, may be made to harmonize with the landscape. Public sentiment is gaining in strength every year against unecessary disfigurements of the face of nature by quarrying, mining, wanton forest destruction, the obtrusive location of smoky factories, the abuse and pollution of watercourses, and the like, and the engineer of the future must take heed lest he fall under public condemnation. The value of natural scenery lies in the rest for eyes and mind, through the soothing charm, the fresh and inspiring influence, the impersonal, unexciting pleasure which nothing but the works of nature offer to man. When true art comes to nature's help is the full result produced.

The personal influence of the engineer, trained in something more than the mere technical knowledge of his profession, can make itself strongly felt in any community, whose people need only an awakening of their better selves to co-operate most heartily with him. And if the exercise of such an influence serves to direct his energies into broader fields of personal profit, there is nothing wrong in taking advantage of it, so long as he descends to no illegitimate or unprofessional efforts. In his clubs and societies he can be instrumental in bringing all these matters to the attention of his colleagues, and instigate concerted efforts for influencing legislation to acquire property worthy of preservation for public use, rich in historical associations or natural beauty. Many districts celebrated for natural beauty are yet being marred and disfigured. Passing from hand to hand, they soon become possessed by persons who can not appreciate them, or are forced by ill fortune to realize money from them in ways wholly destructive of their appearance. Let us hope that our professional brother who is engaged to convert these properties to sordid uses will have had his mind and heart so trained by the pure influences of natural beauty that he will perform his duties without ruth and with a reverent spirit, saving all he can of that which always appeals to our better natures. He will find that he will not lose anything by so doing.

But even if the engineer, after receiving the special training advocated in this paper, should leave the active pursuit of this branch of the profession to others, he can never regret having devoted some time to the study of an art which can not fail to broaden his mind, and develop within him an unsuspected capacity for the appreciation and enjoyment of the beautiful and inspiring in nature.

DATA ON ASPHALT PAVEMENTS IN AMERICAN CITIES, COMPILED BY S. M. GRAY, C. E., PROVIDENCE, R. I.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Asphalt Pavement																					
No	Name of Place	Number of Miles Laid	Length of time it has been laid Years	Has it been re-paired?	How long after laying Years	Present condition	Steepest grade used %	Crown given to street surface Rate	Thickness of concrete foundation	Thickness of compressed asphalt	Is a binder course laid?	Thickness of the binder course	Material in the binder course.	Is different material used next the rails of street railway?	What material	Cost per square yard	This price includes what	Name or brand of asphalt	Occupation of street residence or business	Under what guarantees is pavement laid	Number of miles laid	Length of time it has been laid Years	Has it been re-paired
1	Worcester, Mass.	4.322	3½	No		Good	3	.0119 to .0208	6"	2"	Yes	1½"	Gravel or Broken Stone	Yes	Block Paving	$2.30	All Work	Asphaltina Pavement	Equally divided	5 years	.165	3	No
2	Toronto, Ons.	18.5	11	Yes	Due to special causes	Good	2⅝/100	.0278 to .0347	4" to 6"	2 to 2½"	Sometimes	1"	Broken Stone	Yes	Scoria, Granite or Brick	$2.25 to $2.70	All work	Trinidad Pitch Lake, some Land.	Both	10 years	9.38	3	No
3	Harrisburg, Penn	Not given	11	Yes	Yearly	Fair	4	.0278	6"	2½"	No			Sometimes	Granite and Slag Blocks	$2.73	All work	Barber Asphalt	Both	5 years	None laid by City	6	Yes
4	Bridgeport, Conn.	1.5	2	Yes	Yearly	Fair	1	.0312	6"	2½"	No			Sometimes	Scoria Block	$2.18	All work	Standard Stillman & Godfrey, Atlantic Alcatraz AAA	Both	5 years	None laid by City	1	No
5	Portland, Me	4000 sq yds	The Asphalt pavement was taken up after three years use and replaced with granite																		Gutters and cross walks	2	No
6	Detroit, Mich.	21.568	11	Yes	Generally yearly	Good	1½	.02	6"	2"	Yes	1"	Gravel and Broken Stone	No		$1.33 to $1.90	Concrete, Binder and Surface Coat	Alcatraz Trinidad Lake, Bermudez	Both	5 & 10 years	21.054	8	Yes
7	Hartford, Conn	4.95	3	Yes	2	Good	6 3/10	.01 to .013	6"	2½	Sometimes	1"	Broken Stone	Sometimes	Scoria Block	$2.33 to $2.70	Everything except grading	Trinidad Pitch Lake	Business	5 years	0.08	Very sm	
8	Fort Wayne, Ind.	6.23	9	Yes	5	Fair	1½	.0333 to .0364	5 & 6"	1½ & 2"	Yes	1" & 1½	Broken Stone	Yes	Asphalt Block	$1.45 to $1.60	Concrete, Binder and Surface Coat	Trinidad Lake, Alcatraz.	Residence & Heavy Traffic	10 years	8.50	7	No
9	Meriden, Conn.	None																			10,630 Sq yds.	2	No
10	Binghamton, N.Y.	5.03	9	Yes		Fairly Good	3½	.0167	6"	2"	Yes	½"	Gravel	Sometimes	Stone headers 18" & 12" long	$1.39 to $2.80	Everything except Curb	Trinidad Pitch Lake Alcatraz	Both	5 years	1.0	6	No
11	Canton, Ohio	None																			250,000 Sq yds	10	No
12	Springfield, Mass.	0.27	2	No		Very Good	0½	.0277	6"	2"	No			Yes	Vitrified brick laid outside rails for 18 inches	$2.50 to $3.10	Everything except excavating & grading	Trinidad Lake European Rock.	Business	10 years	1.62	6	No
13	Terre Haute, Ind.	3.60	5	Yes	Various Times	Good	3	.02	5"	1½"	Yes	½"		Yes	Hayden Block	$2.10	Grading, Foundation and Surface Coat	Trinidad Pitch Lake	Both	5 years	5.00	6	Yes
14	Albany, N.Y.	9.326	9	Yes	Various Times	Fair to Poor	6	.0277	6"	2"	Yes	1½"	Broken Stone	Formerly	Granite Block	$3.08	All work	Trinidad Lake Sheet Asphalt	Residence	5 & 7 years	13.0	4	Yes
15	Charlestown, S.C.	0.75	5	Yes	3	Badly Cracked	0 5/100	.0333 to .0417	6"	2"	Yes	1"	Gravel	No		$2.56	All work except hauling away and curbing	Trinidad Lake.	Residence	5 years and 338 per sq yd to second owners	None		
16	Kansas City, Mo.	62.0	11	Yes	Various Times	Mostly Good	10	5" to 6"	4" to 6"	1½ & 2"	With Trinidad Lake	1½"	Broken Stone	Yes	Stone Block	$2.09 & $2.12	All work.	Trinidad Lake, Am Bituminous Rock	Both	Formerly 3 years Now 10 years	2.80	7	Yes
17	Columbus, Ohio.	18.44	21	Yes	Various Times	Good to Bad	1 9/10	.0167	6"	2½"	Will hereafter	1½"	Broken Stone	Yes	Stone Block & Vitrified Brick	$2.70	Pavement complete except grading, curbing, etc.	Trinidad Lake, Kentucky Rock.	Residence mostly	5 years	7.4.89	13	Yes
18	Buffalo, N.Y.	22.167	20	Yes	Various Times	Mostly Good	5 3/10	.0277	6"	2"	Yes	1½"	Stone	Sometimes	Stone	$2.00 to $2.40	All work including relaying side walks and curbing	Asphalt	Both	5 & 10 years	6.67	9	Yes
19	Logansport, Ind.	None	laid yet	1/2	mile contracted for			.0277	8"		Yes	1"	Gravel and Broken Stone	Yes	Paving Brick	$1.75	All work except curb and gutter	Bermudez	Business	7 years	2.0	4	No
20	Charleston, W Va.	None																			7.0	25	Yes
21	Milwaukee Wis.	7.933	5	Yes	2 or 3	Very Fair	4⅝	.025 to .030	6" & 7"	2"	Yes	1"	Gravel and Broken Stone	Yes	Granite Blocks	$1.94 to $2.34	All work. Lower price for 6" of concrete, higher price for 7" of concrete	Trinidad Pitch Lake	Both	5 years	0.208	4	No
22	Fitchburg, Mass.	None																			None		
23	Madison, Wis.	None																			None		
24	Lancaster, Pa.	1.5	8	Yes	8	Shows wear on top	5	.0167	6"	8" Asphalt blocks	No			No		$2.50	Excavation, Stone, Concrete, Sand, Block	-	Both	2 years	2.75	2	No

CONTINUED—DATA ON ASPHALT PAVEMENTS IN AMERICAN CITIES, COMPILED BY S. M. GRAY, C. E., PROVIDENCE, R. I.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
		Asphalt Pavement																					
No.	Name of Place.	Number of Miles Laid.	Length of time it has been laid Years	Has it been re-pair-ed?	How long after laying Years	Present con-dition.	Steepest grade used %	Crown given to street surface Rate	Thick-ness of con-crete foundation	Thick-ness of com-pressed asphalt	Is a binder course laid?	Thick-ness of the binder course	Material in the binder course.	Is different material used next to rails of street railway?	What material	Cost per square yard.	This price includes what	Name or brand of asphalt	Occupation of street, residence or business.	Under what guarantees is pavement laid	Number of miles laid	Length of time it has been laid Years	Has it been re-paired
25	Peoria, Ill.	7.37	7	Yes	5	Mostly Good	7 3/10	.0333 up to 5% grades	6"	1½"	Yes	1"	Broken Stone	No		$1.83 to $1.89	All work except grading	Asphalt	Residence	5 years	19.72	13	Very little
26	Macon, Ga.	None																			4.27	1	No
27	Atlanta, Ga.	2.25	5	Yes	4	Good	5 1/10	.0201	4'6"	2'2½"	Sometimes		Coal Tar	Yes with side bearing rails	Granite and Scoria Blocks	$2.08	All work including the removal of the old macadam which was used for concrete	Trinidad Lake	Residence	10 years	2.0	4	Yes
28	Des Moines, Iowa.	None																			73.0	11	Yes
29	Jackson, Mich.	0.36	1 month				2	.0245	6"	2"	No			Have no asphalt on streets having car tracks.		$1.55	All work except grading, curbing and drainage	Assyrian Asphalt Co.	Residence	5 years	2.25	7½	Some rails
30	Asheville, N.C.	None																			3.1	5	No
31	Dayton, Ohio.	16	6	Yes	3 or 4	Good	3 3/10	.025	4'6"	2'2½"	No			Yes	Use brick between the rails	$2.07 to $2.32	All work except curbing		Both	5 years	10	7	Yes
32	St. Louis, Mo.	10.25	15	Yes	Various Times	Fair	3	.0277	5'to6"	1½"	Yes	1½"	Broken Stone	Yes	Granite Blocks or Brick	$2.25	All work.	Trinidad Lake. Natural Rock.	Both	1 year and 3 year maintenance	1.11	2	No
33	Indianapolis, Ind.	40.02	9	Yes	Every Year	Fair to Excellent	2 1/10	.0292 to .0333	6"	2"	Yes	1"	Broken Stone and Gravel	Yes	Use brick between the rails	$1.75 to $3.00	All work.	Trinidad Lake. Bermudez.	Both	9 years.	21.29	8	Yes
34	Omaha, Neb.	27.41	15	Yes	5	Fair	10	.025	5'to10"	1½" to 2½"	Yes	1½"	Broken Stone	Yes	Brick and Stone	$1.19	All work except curbing	Trinidad Lake, California Bitulithic	Both	5 years	10.91	10	Yes
35	Dunkirk, Ohio.	None																			None		
36	Concord, N.H.	None																			None		
37	Minneapolis, Minn.	12.60	8	Yes	Yearly	Poor to Excellent	1 9/10	.0208 to .0333	6"	2",	Yes	1"	Broken Stone and Gravel	Sometimes	Granite	$2.15	Removal of old cedar pavement, and complete new pavement.	Trinidad, Utah Rock, California Standard	Business and Heavy Traffic	10 years	4.0	2	No
38	Springfield, Ill.	None																			22.0	10	
39	Syracuse, N.Y.	19	10	Yes	3	Good	4	.0333	6"	2½"	No			Yes	Vitrified brick and Sandstone blocks	$2.00 to $2.20	Foundation and wearing surface	Asphalt sheet pavement of standard grade or quality	Both	5 & 10 years	7.0	8	No
40	Parkersburg, W.Va.	None																			10.0	11	Some
41	St. Paul, Minn.	11.9	12	Some	Various Times	Good	6	.0313 to .0333	6"	2"	Yes	1"	Broken Stone	Sometimes	Granite Blocks laid as stretchers	$2.08	All work except curbing	Trinidad Pitch Lake. Bermudez.	Both	10 years	0.7	10	No
42	Sandusky, Ohio.	0.7	5 months				2 3/10	.0283 to .0323	4"	Block Asphalt	Yes	2"	Sand Cushion			$1.80	All work.	New Castle Asphalt Block.	Residence	5 years	5.6	5	Yes
43	Boston, Mass.	10.81	18	Yes	Yearly	Fair	3	.026	6"	1½" to 2½"	Yes with Trinidad Lake Asp.	1½"	Broken Stone and Gravel with asphaltic cement	Sometimes	Granite Blocks	$3.00	All work except grading	Trinidad Lake. Sicilian Rock. Bassogi	Residence	5 & 10 years	0.38	8	Yes
44	Nashville, Tenn.	None																			1.86	6	Yes
45	New Haven, Conn.	3.058	1½	Some	Along R.R. Tracks	Good	3 9/10	.026	6"	2"	No			No		$3.36 to $3.80	All work.	Sicilian Rock.	Residence	10 years	1.491	1½	No
46	Elmira, N.Y.	0.8	3	Yes	2	Good	1 9/10	.0252	5 9/10"	1½"	Yes	1½"	Broken Stone	Have streets	no asphalt on streets having car tracks	$2.49 to $2.89	Foundation, Binder and Surface coat	Trinidad Lake	Residence	10 years	0.5	3	No
47	Meridian, Miss.	None																			0.68	6 months	
48	Louisville, Ky.	Not Given	14	Yes	Continually	Very Good	5 9/10	.0252 to .0190	6"	2"	Yes	1½"	Broken Stone	Formerly	Granite Blocks			Asphalt	Both	5 & 10 years	Not Given	7	Yes
49	Toledo, Ohio.	21.0	13	Yes		Very Fair	3		6"	3"	Yes	1"	Gravel	Sometimes	Medina Blocks Outside and Indiana rails	$1.52	Foundation, Binder and Wearing Surface	Trinidad Pitch Lake, Trinidad Asphalt.	Residence	5 years	3.50	10	Yes
50																							

DATA ON BRICK PAVEMENTS IN AMERICAN CITIES, COMPILED BY S. M. GRAY, C. E., PROVIDENCE, R. I.

1	2	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
		Brick Pavement														Other Pavements		
No.	Name of Place.	How long after laying ? Years	Present condition	Steepest grade used. %	Crown given to street surface Rate.	Thickness of concrete foundation	Is a cushion coat laid.	How thick.	Special pavement next to rails of street railway	Cost per square yard.	This price includes what.	Name or brand of brick.	Occupation of street residence or business.	Under what guarantees is pavement laid.	Which is more satisfactory asphalt or brick.	Kind of Pavement.	Number of miles laid.	Remarks.
1	Worcester, Mass.		Good	8	.0208	6"	Yes	1"		$2.65	All work except hauling away	Vitrified Brick	Equally divided	3 years	Not fairly tested yet.		10.467	
2	Toronto, Ont.		Good	2 5/8 in.	.0278 to .0347	4"	Yes	1/2" to 3/4"		$1.40 to $1.60	All work	Canadian Brick	Residence	5 years	Both are satisfactory		230	Repairs to asphalt pavements caused by cuts for sewer and water service. Asphalt between rails not satisfactory
3	Harrisburg, Penn.	Yearly	Fair	2		6"	Yes	1/2"	Brick pavement to lead by Street Railway Company			only	Residence					
4	Bridgeport, Conn.		Chipped at corners	1		6"	Yes	3/4"	Scoria blocks sometimes				Both		Asphalt	Stone Blocks Macadam Telford	1.33 70.	Asphalt not suitable near tracks. Blocks laid ashlar piers and streetcars wear out. Side slopes must be nearly flat.
5	Portland, Me.		Good			6"				$2.30	All work	Portland Stone Ware Co.		None		Granite Cobble Macadam	8.12 1.08 7.41	
6	Detroit, Mich.	6	Fair to Good	4	.023	6"	Yes	1/2"		$1.25	Concrete, Sand Cushion and Brick	Twelve different kinds	Both	3 years	Asphalt		216.831	
7	Hartford, Conn.	all amount of	Brick	has been	laid. It	is not	liked generally,	and no more	will be laid						Asphalt	Granite Asphalt Block	0.1 2.0	
8	Fort Wayne, Ind.		Good to Bad	3 5/10	.0333 to .0364	6"	Yes	2"				Metropolitan Block	Both	3 years	Asphalt		12.50	The smaller figure in col 17 denotes ponds with the smaller figures in curb joints. Brick also laid on 4" of broken stone
9	Meriden, Conn.		Worn	Very flat	.0208 to .0284	6"	Yes	1"	Moulded brick on inside next to rail	$2.71 to $2.65	Everything except resetting curb	Reed & Ellis, Mack Brick	Stores and factories	5 years		Granite Block Trap Rock Macadam Telford	3.38 on pt 4.88	
10	Binghamton, N.Y.		Fairly Good	1 5/8	.0167	6"	Yes	1/2"		$1.72 to $2.40	Everything except curb	Corning, Mack, and Syracuse	Stores	5 to 10 years	Opinion divided		0.34	Some asphalt was laid 7 years without repairs.
11	Canton, Ohio.		Fair	5	.0167 to .0416	6"	Yes	1"	Between rails brick is laid as stretchers.	$1.00	Grading, foundation and surface.	Canton shale pavers with cement filler	Mostly business	For labor 1 year.	Asphalt is less noisy. Brick is more durable.	Some cobble but replacing with brick.		Used cement filler with 1/2" tar expansion joint at curb and across street at intervals of 36 to 50 feet.
12	Springfield, Mass.		Very Good	2.	.0277	6"	No			$2.25	All work	Syracuse Vitrified Brick	Both	1 year		Granite Block Macadam	2.34 26.98	
13	Terre Haute, Ind.	A	Good	5	.0167	5"	Yes	2"		$1.20	Grading, Foundation and Wearing Surface.		Both	5 years	Opinion divided	None		Brick is also laid on a broken stone foundation but is not satisfactory
14	Albany, N.Y.	Due to special causes	Excellent	9 1/10	.0277	6"	Yes	1 1/2"		$1.79	All work.	Repressed Vitrified Paving Brick.	Both	5 to 10 years	Brick thought not tested as long as Asphalt		56.57	Advantages claimed for Brick 1. lower first cost, better footing for horses, repaired without skilled mechanics, city plant.
15	Charlestown, S.C.															Various kinds	28.12	The asphalt guarantee as given is equivalent to a cost of $2.50 and the 5 year guarantee
16	Kansas City, Mo.	Various Times	Mostly Good	10 5/10	3" to 6"	6"	Yes	2"		$1.50	All work.	Kansas City Brick, Diamond, Pittsburg	Both	Formerly 5 years. Now 7 years.	Asphalt.	Stone Blocks Gravel & Macadam	2.12 30.88	
17	Columbus, Ohio.	Various Times	Mostly Good	9	.0167	6"	Yes	1/2"		$1.25	Pavement complete except grading, curbing, etc.	Hayden, Hollowed Wafers, Nelsonville Blocks and various bricks.	Residence mostly.	5 years	Brick on the whole.		22.33	Brick is also laid on a foundation of 8" of broken stone.
18	Buffalo, N.Y.	Various Times	Mostly Good	3	.0277	6"	Formerly	1"		$2.00 to $2.40	All work including re-laying sidewalks and curbing.	Brick.	Residence	5 to 10 years	A demand for both	Stone	108.43	
19	Logansport, Ind.		Good	6	.0238 to .0311	6" to 8"	Yes	2"		$1.52	All work except curb and gutter	Poster Block, Clinton Block.	Business	3 years		Macadam	1.0	
20	Charleston, W Va.	Various Times	Good	2 4/10 in.	.0381 to .0487		Yes	2 1/2"		$0.93 3/100	Sand, boards & brick.	Charleston or Hale	Both	None			None	Foundation for brick pavement is 3" sand, 1" layer white pine board, 2" sand, the surface brick, sand filling.
21	Milwaukee, Wis.		Fair	8	.0251 to .0273	6"	Yes	1/2"		$1.73	All work	Nelsonville or Gales preferred	Business	5 years	Asphalt if grades allow		66.282	For asphalt foundation, 6" concrete on residence streets and 7" concrete on business streets.
22	Fitchburg, Mass.															Granite Blocks	40,000 sq yds	
23	Madison, Wis.														-	Macadam	21.33	
24	Lancaster, Pa.		Good	4 1/2 in.	.0111 to .0167	5" of stone 4" of gravel 1" of sand				$1.40	Excavation, Stone, Gravel, Sand, Brick, Sand	Vitrified Brick, Mack, Hallwood Clean Field, Montello, Canton.	Both	2 years	Brick	Granite Blocks	2.0	Have a small amount of sheet asphalt that is constantly being repaired. Have replaced some block asphalt with brick.

CONTINUED—DATA ON BRICK PAVEMENTS IN AMERICAN CITIES, COMPILED BY S. M. GRAY, C. E., PROVIDENCE, R. I.

1	2	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
		Brick Pavement														Other Pavements		
No	Name of Place	How long after laying Years	Present condition	Steepest grade used %	Crown given to street surface Rate	Thickness of concrete foundation	Is a cushion coat laid	How thick	Special pavement next to rails of street railway	Cost per square yard.	This price includes what.	Name or brand of brick.	Occupation of street residence or business.	Under what guarantees is pavement laid.	Which is more satisfactory asphalt or brick.	Kind of Pavement.	Number of miles laid.	Remarks
25	Peoria Ill		Mostly Good	8.4⅝	0233 up to 3% grades	6"	Yes	1½"		$1.38 to $1.43	Foundation Sand Cushion Brick Sand Filler	Brick	Both also Heavy Traffic	None	Both are good if properly laid	Cedar Block Stone Block Cobble	0.34 1.10 0.90	
26	Macon, Ga		Splendid	2 1/100	.0189	6"	Yes	2"	Special brick on inside next to rail	$2.08	All work	Robbins Paver	Stores	$500 Bond		Shell Concrete Granite Blocks	1.428 2.0	
27	Atlanta, Ga	3	Good	6	.0201	6"	No			$1.85	All work including the removal of the old surface unobtained for concrete	Several kinds used	Mostly Residence	5 to 10 years	Asphalt	Granite Blocks	58.0	
28	Des Moines, Iowa	9	Good	12½	.07	6"	Yes	2"		$1.40	All work using Murphy Grout Filler		Both	5 years			2.0	Portland Cement grout filler is equally sanded as the Murphy grout, and costs 10 cents per sq yard less
29	Jackson Mich	near outskirts	Mostly Good	3 3/10	.0218 to .0238	6"	No			$1.28	All work except grading curbing and drainage	Jackson's Canton Brick, Metropolitan and Worrall Blocks	Both	5 years				
30	Asheville, N.C.		Mostly Good	7	.025	No concrete foundation	Yes	3"	Granite Blocks sometimes used	$2.00	All work.	Robbins Paver	Both	3 years and none		Granite Blocks Macadam	1.6 2.0	
31	Dayton, Ohio	4 or 5	Mostly Good	4.2⅝	.025	4½ to 6	Yes	½"		$1.45 to $1.87			Both	5 years	Asphalt		2.5	The smaller prices in cols 17 and 33 are for 4" of concrete the larger for 6" concrete 4" on residence, 6 on business streets
32	St. Louis Mo		Good	4	.0277	6"	Yes	1½"		$1.46	All work.	Different Brands	Residence	1 year	Brick has not been tested long enough		397.96	
33	Indianapolis Ind	Every Year	Poor to Good	6 7/100	.0292 to .0333	4 to 6"	Formerly	½"		$1.50 to $2.00	All work		Both	5 years now	Asphalt	Wooden Blocks Macadam	10.40 3.71	Very little brick being laid now
34	Omaha, Neb.	2 to 10	Fair	11	.025	6"	Yes	1"		$1.40 to $2.14	All work except curbing	Galesburg, St Joseph, Lincoln, Des Moines, Louisville	Both	1 to 10 years	Asphalt	Stone Wooden Blocks Macadam	24.41 10.73 1.88	Asphalt has also been laid on a foundation of 6" to 8" broken stone, and 6" concrete with 4" broken stone
35	Dunkirk, Ohio																None	
36	Concord, N.H.															Granite Block	0.5	
37	Minneapolis, Minn.		Good but show wear	1	.0139 to .0333	6"	Yes	1"	Special brick each side of rail to fit shape of rail	$1.60 (Day labor by City)	Removal of old cedar pavement and a complete new pavement	Des Moines, Purington Salesburgh Brick.	Business and Light Traffic	On material 10 years	Opinion divided Asphalt preferred by City Engineer	Granite Cedar Macadam	9.62 71.00 4.60	
38	Springfield, Ill		Good	4	.0333	6"	Yes	1"		$1.05 to $1.25	All work except curbing	Brick,	Both	None after work is accepted		Cedar Block Macadam	5.0 0.6	Brick is also laid on a foundation of one course of brick laid flat on 3" of river sand.
39	Syracuse, N.Y.		Good	6	.0333	6"	Usually	½"		$1.85 to $1.91	Foundation and wearing surface	Vitrified Brick.	Both	1 to 5 years	Asphalt	Sandstone Blocks Asphaltine	1.75 2.0	
40	Parkersburg, W Va	10	Mostly Good	15	.0277	No concrete foundation 6" of gravel, 2" of Sand				$1.75 to $1.93	All work except curbing	Wheeling Mfg Plan	All the business streets, some residence streets	5 years				Brick with 13% grade are laid inclined with offsets of ½". Have streets with 8% grade with brick laid thus
41	St. Paul, Minn.		Mostly Good	7	.0313 to .0333	6"	Formerly	1"		$1.80	All work except curbing	Des Moines Galesburg Mt Brick	Residence	None	Asphalt		32.5	
42	Sandusky, Ohio	3	Good	2⅝	.0241 to .0283	6"	Yes	2"		$1.50	Excavation and pavement in place.	Belen, Jones Block	Residence and Stores	3 years	Brick is satisfactory except for the noise			
43	Boston, Mass.	Often	Fair to Poor	Very flat	.026	6"	No		Brick pavement is mostly experimental.				Residence	None	Asphalt	Granite Blocks Cobble Telford & Macadam	8.83 1.47 26.31	
44	Nashville, Tenn.	4	Mostly Good	7	.0313	No concrete foundation 12" Bedding & Broken Stone, & Sand				$1.80	All work.	Cloverport Paver, Robbins & Reynolds Pavers	Residence mostly	1 year		Granite	2.64	Brick Pavement of Standard Pavers has not been repaired. Pavement of local brick removed after 8 years. Worn
45	New Haven, Conn		Good	2	.026	6"	Yes	1½"		$2.33	Complete pavement including curbing, inspecting and engineering.	Block work Cut, Syracuse, Barrington Porter repressed.	Both and Heavy Traffic	5 years			36.928	The higher figure in col 17 was for a street with double track railway
46	Elmira, N.Y.		Good	0⅞	.0238	6"	Yes	1"		$1.86 to $2.17	All work.	Vitrified Brick.	Stores	5 to 7 years		Granite Block Medina Stones	0.5 0.1	
47	Meridian, Miss.			1 0/100	.0200 to .0351	6"	Yes	1½"		$1.70	Concrete, Cushion, Brick and Sand Filler	Athens Block, Robbins Pavers.	Stores	5 years			0.6	
48	Louisville, Ky	Continually	Very Good	3 7/10	.0324	6"	Yes	1"				Vitrified Brick.	Both	5 years	Asphalt			
49	Toledo, Ohio	7	Good	1		6"	Yes	1"		$1.40	All work.	Various Kinds.	Both	5 years	Asphalt for residence Streets, Brick for business	Stone Plank Macadam and Cedar Block	60.0	

RESTRICTION OF THE WASTE OF WATER.*

By Allen Hazen, C. E.

The temptations to abuse the privilege of using water supplied at a fixture rate are quite as great as they are in the case of gas. In fact the opportunities are better, because gas can not be discharged unburned into a house without making it uninhabitable, and if an excessive quantity of gas is burned, the house becomes too warm for comfort. There is thus a certain physical limit upon the amount of gas which can be used in a house. With water, however, this is not so. Faucets can be left open and leaks allowed to remain unrepaired, and the water allowed to flow to the sewers in absolutely unlimited quantities without benefiting anyone. It has been found by careful and extended observation in both American and European cities that in the best class of modern houses an abundant supply of water for domestic purposes does not exceed from twenty to forty gallons per capita daily. Only in the very largest places, where many servants are kept, and much water is used for lawn sprinkling, do the quantities become as high as fifty or sixty gallons per capita daily. As an average for American conditions, thirty gallons may be taken as a liberal allowance for all the water which can be used.

The amount of water used in schools, hospitals, public buildings, public fountains, for street sprinkling, etc., is rarely more than five gallons per capita daily.

Various ways have been suggested for preventing the waste of water. One of these ways has been very much more successful than any other. This is the method which has been universally adopted for the sale of gas, namely, the use of meters. Under this system the water supplied to each consumer is measured and payment demanded according to the amount used.

There is often a prejudice against the use of meters, which arises from the thought that people will be limited in the use of water, and can not use as much as they desire without making excessive payments for it. There is also the feeling that if the consumption of water should be reduced to one-half or one-fourth, each person would have to get along with one-half or one-fourth as much water as they have used. As a matter of fact, this idea does not present even remotely the truth. A majority of people are reasonably careful in the use of water and do not waste excessive amounts. It is the minority of people, who, by carelessness or willful waste, discharge water into the sewers in large quantities, and increase enormously the amount of water which must be provided, and consequently the cost of water to all the people.

If a meter is put on every service, the people who waste water will have to pay for it, and others will be relieved from the burden, and the cost of water to them will be materially reduced. The cost to the people who are wasting water will also be reduced, if they are willing to learn by experience, as nearly all of them will, that they

*From Report to Pittsburg Filtration Commission.

can not waste water without paying for it.

The cost of installing a meter system is considerable, but it is very much less than the cost of installing the pumps, filters, reservoirs, and larger mains that will be necessary in case unrestricted waste is allowed to continue. The meter system also results in a saving in water rates to all people except those who under previous conditions are fraudulently or through carelessness securing quantities of water largely in excess of those to which they are entitled.

The meter system has been adopted and applied to all consumers by a number of European cities, notably by Berlin, and by a few American cities, namely, Atlanta, Yonkers, and Madison. It has been adopted and applied to all services except the smaller domestic services by a much larger number of American cities,—Milwaukee, Providence, Syracuse, Worcester, Fall River, Hoboken, Lawrence, Manchester, Utica, Brockton, and Pawtucket have adopted in this way, and have more than half of their services metered. In addition to the above, New York, San Francisco, Kansas City, Lowell, Nashville, Toledo, Dayton, Des Moines, Peoria, Springfield, Quincy, Bay City, and Taunton have metered more than a quarter of their services, and nearly all cities which have started upon the introduction of the meter system are extending its use as circumstances permit.

It is found that it is impossible to operate a water-works system so that all of the water will be accounted for. In the best German practice, with all the services metered, sometimes as much as 90 per cent. of all the water pumped is accounted for. This, however, is rare, and has never been reached in American practice. Sixty per cent. is a good American average, and on this basis the average meter rate should be about nine cents per thousand gallons.

With very large consumers the rate should be somewhat less than for small consumers, and eight cents may be taken in these cases as not far from right, while the domestic rate must be maintained considerably higher on account of the greater slip in the small meters and waste and leakage from service pipes.

THE UTILIZATION OF CITY REFUSE.

By W. F. Morse.

Four years ago a statement was made by a distinguished English scientist to the effect that the waste produced by each inhabitant of a city was sufficient, when properly burned, to supply each individual with an electric light of eight candle power for two hours every night in the year. At the time this was thought to be a somewhat fanciful assertion, and impossible to be realized. But the development and progress of garbage and waste disposal by cremating furnaces, under varied forms and conditions, has proven that the statement is in a fair way to be demonstrated.

It is certain that the combustible waste which forms a considerable proportion of the whole collection of city refuse can be utilized or employed for fuel to destroy the organic matters, and thereby save a large percentage of the expense of

disposal work as hitherto carried on.

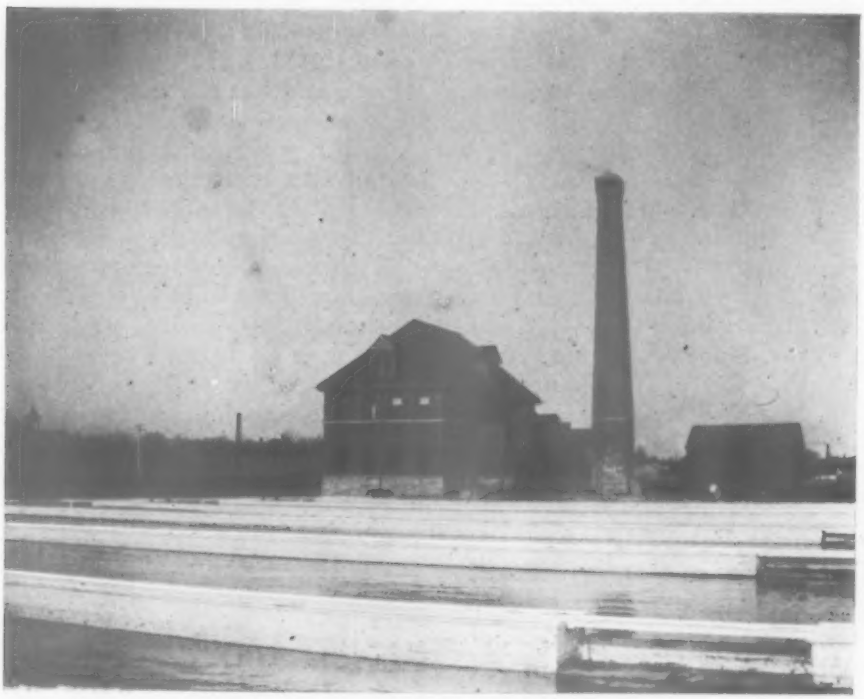
City refuse may be roughly classed under three heads:

Organic: Garbage and kitchen offal, bodies of animals, condemned foods, market refuse and putrescible matters of every kind, about	17 to 20%
Combustible refuse, about	20 to 25%
Inorganic: Street sweepings, ashes including broken glass and crockery, yard and floor sweepings, oyster and clam shells, and also trade refuse in large quantities, about.....	55 to 63%

small a cost as to make the work practically self-supporting.

The operation of the waste disposal plant just established in the city of Boston has shown that it obtains from the destruction of a comparatively small percentage of refuse sufficient heat to move all machinery required for its operating, heating and lighting, and also a large proportion of heat units that can not at present be utilized.

It follows naturally that the ex-



SEWAGE DISPOSAL WORKS AT HAMILTON, ONT.

When three separations can be made of the garbage, combustible refuse, and ashes and street sweepings taken together, and when the first two items are brought together at one convenient point, there can be constructed disposal plants which shall destroy the garbage by utilizing the heat obtained from the worthless parts of the refuse, at so

tension of this principle to its utmost available limit, and the utilization of these units of heat for the disposal of organic substances, is not so difficult to be accomplished as was formerly supposed. There are two or three conditions which must be predicated in advance.

A separation of the garbage from ashes and refuse should be made.

The garbage should be collected with not more than 10 per cent. admixture of foreign matters, and with as small an amount of liquid as is possible.

The refuse must also be separated from ashes and garbage and kept in a dry condition. It may include everything which enters into the household life of the people, excepting only kitchen offal and ashes. Under the usual separation in New York and Boston, it includes tin cans which are used for dry substances, as well as every class or grade of paper, cardboard, rags, empty bottles (excepting those for catsup or sauces), carpets, old shoes and rubbers, worn out or superfluous clothing, carpets and rags, broken or worthless furniture, boxes, barrels, excelsior, mattresses —every discarded article that has been employed in the home life of the household, shops or factories.

To utilize the heat from the burning of material and apply it effectively for the cremation of organic waste has necessitated an entirely new departure in the art of constructing cremating furnaces; and this, after elaborate experimentation and great expenditure of time and money, has been successfully accomplished.

It has been demonstrated that the mixed material of city waste collections can be destroyed chiefly by means of its own fuel—with the use of a very insignificant amount of coal or wood to start the process. In a city where coal and wood are held at a price of fifteen to twenty dollars per cord and ton, and where a furnace has been in operation for two years destroying the mixed garbage and refuse of the community, no fuel has been required, with the exception of a few sticks of wood to begin the work. Therefore the problem of disposal of organic waste by utilizing the combustibility of the products cast off by the community has been solved.

That this process is practicable in the majority of American cities is certain; and that it can be done without objection on a sanitary score is positively determined by the use of approved apparatus for consuming the products of combustion. Every particle of carbon and smoke is converted into gas, and after being passed through a boiler, discharged in an almost invisible condition as it issues from the chimney. For several years there has been destroyed in the largest city of this country, on one of the main avenues, a quantity of garbage, offal and manure equivalent to one ton daily, without the slightest objection or complaint of nuisance from any one in the building or the surrounding houses.

The employment of this system of destroying organic wastes by combustible refuse is certain to be adopted when thoroughly understood by the authorities of cities, because it is distinctly a step in advance of the present methods of employing fuel in large amounts and of throwing away the combustible refuse.

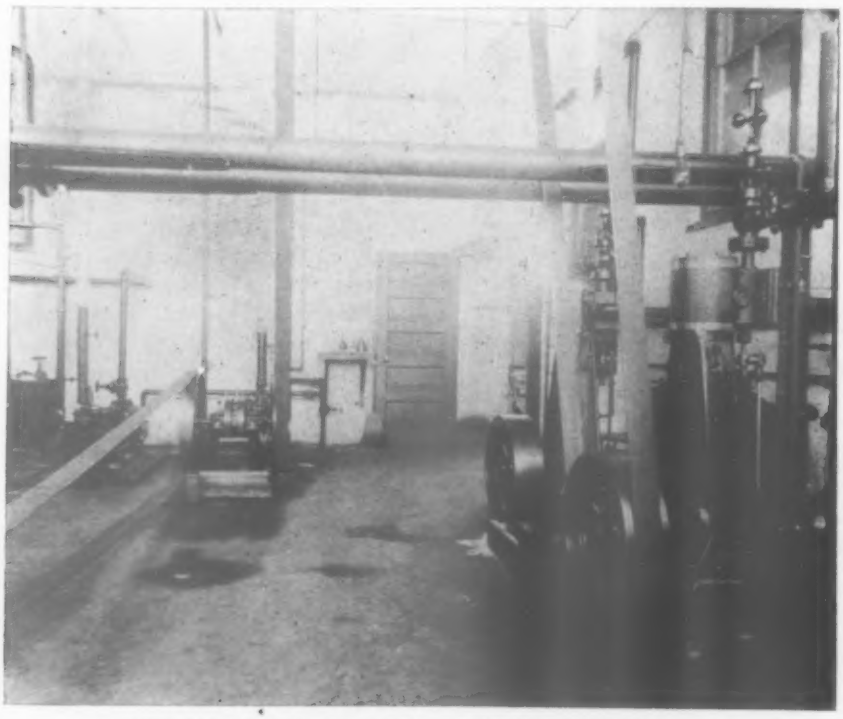
The development of the art of sanitation as applied to the disposal of waste and the prevention of infectious diseases by disinfection during recent years has been rapid and substantial. A review of the field in the United States demonstrates how much has been accomplished by the efforts of sanitary associations and the individual example of a few earnest men, united to the practical business methods of others who have engaged in the work as a profession or avocation.

Who would have predicted ten years ago, when Mr. Andrew Engle

exhibited at the meeting of the American Public Health Association in Milwaukee a small sheet-iron model of a furnace that actually burned garbage quickly and cleanly, that a hundred cities and towns would have since adopted that method of destroying their dangerous waste, and that another hundred would be seeking the latest improvement for effectually destroying it at the smallest cost consistent with protection from nuisance?

THE OUTLOOK FOR PUBLIC WORK.

Special reports to MUNICIPAL ENGINEERING from officials throughout the country indicate that an unusual amount of public work will be done this year in the smaller cities and towns. On April 15 city engineers in all cities of the second and third class were asked to send to this magazine the most accurate information that could be furnished at that time as to the probable work during the season of 1899. A tabulation of this information is given. In a majority of the cities, however, plans for the season have not yet taken such shape as to enable officials to furnish definite information as to probable work, and in the larger cities, where the greatest amount of work will be done, accurate information is unobtainable at this time. The reports which have been received, however, are a pretty fair indication of the general outlook, which is favorable to more work on street



INTERIOR OF SEWAGE DISPOSAL WORKS, HAMILTON, ONT.

paving, largely asphalt and brick, than in previous years. According to indications there will also be more sewer building than usual.

The cities where little or no work will be done, according to reports received, are Bangor, Me.; Charleston, S. C.; Des Moines, Ia.; Harrisburg, Pa.; Hoboken, N. J.; Leadville, Colo.; Medford, Mass.; Meriden, Mass.; Newark, O ; Rock Island, Ill.; West Newton, Mass., and Portland, Ore. In some of the cities in Iowa and Indiana work has been delayed by new legislation affecting improvements, but it is not expected that this will be serious in Indiana.

Supplemental to the accompanying table the news in the "Improvement and Contracting Department" of this number is also indicative of much activity. Additional information is noted in the reports from different cities as follows:

Altoona, Pa. (Harvey Linton, C. E.)—The sheet asphalt work this year will be repairs only. Brick sidewalks will be built, 5,000 feet in length. Storm sewers will be built, 6 feet 2 inches by 9 feet, to cost $18,000; and 9,160 lineal feet of 24-inch concrete sewers, to cost $36,000. Will buy a steam boiler for stone crusher.

Amsterdan, N. Y. (F. E. Crewe, City Engineer.)—About 12,000 square yards of paving will be constructed on 6-inch concrete foundation; not yet decided whether brick or asphalt. About four miles of macadam roads will be built by the city, which has its own plant. The Troy Public Works Co. has the contract for water mains extensions to cost $31,000

Augusta, Me. (W. B. Getchell, C. E.)—The Kennebec Light and Heat Co., will commence on a new station, built of stone, very soon.

Butte, Mont. (F. C. Bachenbach, C. E.)—Will buy a street sweeper, four street sprinklers and four dump wagons in May. Will lay 17,000 square yards of granite block on concrete foundation, in Park, Broadway, Grant, Wyoming, Academy, and Arizona streets, at a cost of $65,000.

Bay City, Utah (George Turner, C. E.)—A new water plant will be built in West Bay City at a cost of $200,000.

Cedar Rapids, Iowa (G. H. Merrideth, C. E.)—Will do some paving and will construct some sewers, but extent of work not yet determined.

Clinton, Iowa (Chas. P. Chase, C. E.)—A public park and levee, at a cost of $25,000.

Columbia, Pa. (E. W. Goerke, C. E.)—Macadam, as well as sidewalk paving, will be done during the year, but at present unable to give quantities.

Columbus, Ohio (Julian Griggs, C. E.)—Asphalt repairs, to amount of 4,090 square yards, at estimated cost of $6,700.

Council Bluffs, Iowa (S. L. Etryer, C. E.)—The recent decision of the supreme court will very likely prevent any public work this year. The state law regarding assessments is regarded as unconstitutional.

Duluth, Minn. (T. F. McGilvray, C. E.)—Wood block, on sand foundation, 4,000 square yards; estimated cost, $800.

East St. Louis, Ill. (L. L. Harper, C. E.)—A brick inlet sewer, at estimated cost of $250,000, will be let this year.

Elmira, N. Y.—Budget not yet made up and can not give definite information.

Fond du Lac, Wis. (E. B. Parsons, C. E.)—Can not now give information, but no extensive work is contemplated.

Ft. Wayne, Ind. (H. B. Manning, C. E.)—In addition to work noted in table, will lay 10,000 square yards of asphalt block pavement.

Holyoke, Mass.—A new reservoir will be built, with a capacity of 300,000,000 gallons. No estimates yet on fixing a sewer.

Haverhill, Mass. (Robert R. Evans, C. E.)—No paving work has been voted yet, but probably will be soon.

Hamilton, O. (L. A. Dillon, C. E.) Second, North Third and South Third streets will be paved. Bids will be received on both asphalt and brick.

Indianapolis, Ind. (J. B. T. Jeup, C. E.)—Work delayed awaiting decision of courts on constitutionality of new improvement laws, but will begin very soon.

Kalamazoo, Mich. (G. B. Pike, C. E.)—Considerable brick pavement and sewer work contemplated. The work will be done by day labor.

Lafayette, Ind. (W. K. Eldridge, C. E.)—About five miles of cement sidewalks will be built, and 2,800 square yards of asphalt block pavement, besides other work noted in table.

Moline, Ill. (H. G. Paddock, C. E.)—A new administration is about to go in, and no work is laid out yet.

Michigan City, Ind (H. M Miles, C. E.)—Have received bids on both asphalt and brick, but impossible to say at this time which material will be used.

Middletown, N. Y. (Van Alen Harris, C. E.)—The work to be done this season has not yet been fully decided on, but all work

TABLE SHOWING WHERE PUBLIC WORK WILL BE DONE IN 1899.

Cities.	Asphalt.		Brick.		Macadam or Telford.		Sewers.		Water Mains.
	Sq. Yds.	Est. Cost.	Sq. Yds.	Est. Cost.	Sq. Yds.	Est. Cost.	Brick. Lin. Ft.	Pipe Lin. Ft.	Lin. Ft.
Albany, N. Y			45,000	$100,000				2,000	
Altoona, Pa			2,000	3,600					6,000
Amsterdam, N. Y	Brick or	aspt,abt	12,000	sq. yds.	20,000			2,600	5 miles
Asheville, N. C					some	work.	Few 6 in	brick	4,200
Auburn, N. Y	18,000	$36,000						7,500	
Augusta, Me					5,000				
Battle Creek, Mich			15,000				Some	3,150	7,000
Bay City, Mich			50,000	75,000			9,000	10,000	
Bloomington, Ind					5,000	2,700			20,000
Butte, Mont							500	7,000	
Clinton, Ia								2,000	Some
Columbus, O	2,290	4,956	8,230	11,472					
Columbus, Ga					11,500	8,000			
Dayton, O	16,000		9,500					58,150	
Duluth, Minn			17,964	23,400		2,300			
East Liverpool, O			6,500	10,000				6 miles	
East St. Louis			160,000					26,000	
Elkhart, Ind	23,000	56,000	3,700	5,000				11,000	
Erie, Pa	4,400		8,400					3,260	
Ft. Wayne	20,000		30,000				5 miles		
Galesburg, Ill			3,750	6,300			800	Some	
Grand Rapids, Mich	14,310	28,911	8,815	16,791	18,520	22,900		10,000	25,000
Hamilton, O	16,700		22,300		9,700				
Hazleton, Pa								3,000	
Hyde Park, Mass								6,500	
Jacksonville, Ill			16,000					7,500	11,000
Jamestown, N. Y			20,000	35,000					
La Crosse, Wis			6,000	10,000					4,000
Lafayette, Ind	2,800		1,600		4,000			2,000	
Lockport, N. Y							1,960	1,960	1,154
Logansport, Ind	4,000	8,000					6,500	22,000	
Manistee, Mich					7,515	4,720			
Meriden, Conn	4,200	11,000			15,000			14,000	
Michigan City, Ind	Bids rec	'd on bo	th asph	alt and	b'ck for	31,200	sq. yds.	900	
Middletown, N. Y			1,800					2,500	5,000
Minneapolis			22,462	36,164				17,930	27,792
Montgomery, Ala			14,000	22,000					22 miles
Nebraska City, Neb			8,000	7,500				2,200	
Newport, Ky			1,800	3,500	30,000		20,000	Proje'td	1,200
Norristown, Pa								3,700	
Peoria, Ill	14,000	53,000	36,000	51,000			6,000		
Pittston, Pa	3,150	8,685						11,330	
Plainfield, N. J	Either	asphalt	or brick	30,000	sq. yds.				
Port Huron, Mich					8,000	3,000		2,500	
Scranton, Pa	800	2,500	69,930	160,563				50,792	
Sioux City, Ia	7,500	16,800	19,000	30,300					
Springfield, Mo	2,100	4,800			2 miles			10,000	10 miles
Terre Haute, Ind			800	1,000			30,000	4,000	
Toledo, O	20,493	38,781	103,775	192,266	6,166	7,200	10,707	19,866	
Topeka, Kan			10,500	12,500			4,200	40,900	
Wooster, O			2,400	3,500					

will be done by day's labor and no contracts will be let. May buy a street sweeper in May or June.

Minneapolis, Minn.—Will lay 16,780 sq. yards of stone paving on sand foundation, at expense of $31,540. Will build a bridge at cost of $20,000.

Montgomery, Ala. (J. W. Persons, C. E.)—Will lay about three miles of cement sidewalks in small contracts.

Muskegon, Mich. (C. S Gamble, C. E.)—Municipal year does not begin until May 1 and will then give information as to what will be done. Brick paving is contemplated.

Nashua, N. H. (A. W. Dean, C. E.)—Stone pavement on sand at a cost of $6,000.

Nebraska City, Neb. (A. M. Munn, C. E.)—The brick going to be done this year is to replace wood block laid in 1888.

Newport, Ky. (W. L. Glazier, C. E.)—Combined concrete curb and gutter to the extent of 20,000 lineal feet will be constructed, contract for which will be let in June. Cement sidewalk 2,000 feet in length will also be built.

Port Huron, Mich. (F. F. Rogers, C. E.)—Probably two miles of cement sidewalk will be built. The new gas company will erect a plant and lay two miles of pipes. The old company will spend $25,000 in extensions.

Scranton, Pa. (Joseph P. Phillips, C. E.)—About 36,000 lineal feet of curb will be set in connection with the street paving reported in the accompanying table.

Terre Haute, Ind. (R. H. Sparks, C. E.)—Four miles of cement sidewalks will be built at a cost of 9 cents per square foot. The contracts are all let.

Toledo, Ohio (W. H. Brown, C. E.)—In addition to other work, a bridge will be built at a cost of $40,000.

Topeka, Kan. (W. H. Barnes, C. E.)—The new sewer system will cost about $40,000. The city engineer will make plans for new water-works at a cost of $440,000. If bonds are voted a new city hall will be built to cost about $100,000. It will contain an auditorium.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

CITIES OWNING COMBINED ELECTRIC LIGHT AND WATER-WORKS SYSTEMS, AND THE COST.

Can you cite me to a few cities, 6,000 to 10,000 population, which own and operate an electric light and water-works system in connection with each other?

Can you volunteer me any information on the cost of such systems that you may have knowledge of? We should like to know how many arc lights each city has, on what schedule they are run, what is the cost per light to each city and any other information that you may be able to advance.

W. L. F., Kenton, Ohio.

Among cities of somewhat larger size than those mentioned, which own their electric light and water plants, are, Aurora, Bloomington and Springfield, Ill., and Auburn, Ind. The first two operate the two plants in conjunction and report their experience as satisfactory. The last has recently completed its water plant and has not yet had much experience in management. Cities of about the population mentioned, owning their electric light plants, are:

CITY.	No of Lights.	Schedule.	Cost of Light per Year.	Cost of Plant.	Miles of Street Lighted.
*South Norwalk, Conn.	100	Moon.	$60 22	$14,000	15
Champaign, Ill.	72	"	64 30	.....	.....
†LaSalle, Ill.	98	"	46 00	12,000	.....
†Ottawa, Ill.	133	All night.	57 50	.....	2 miles sq.
†Kendallville, Ind.	60	"	30 00	6,000	6
†Emporia, Kan.	87	"	108 00	.....	25
Brainerd, Minn.	80	Moon.	.....	.....	5
†Fremont, Neb.	70	.....	44 28	.....	13
†Dunkirk, N. Y.	75	Moon.	45 50	21,000	14
*Fredonia, N. Y.	68	"	42 00	.....	6
†Marietta, O.	112	"	99 00	18,000	17 circuit.
†Martin's Ferry, O.	100	"	.....	21,000	15 of wire.
†Fort Worth, Tex.	68	"	64 48	44,000	5

* Indicates gravity water supply owned by city.
† Indicates pumped water supply owned by city.

Champaign, Ill., and Brainerd,

Minn., have private water companies. Much additional information can be found in reports of the American Society of Municipal Improvements, for 1896 and 1898, D. L. Fulton, Secretary, Allegheny, Pa. Your other question should be answered by an electrial engineer or manufacturer, and can only be answered accurately when full knowledge of the local conditions is secured. See our advertising columns for information regarding competent persons for such work.

The following information regarding Aurora, Ill., is at hand and may be of interest although its population is about 20,000: "Aurora has at present a plant, consisting of three dynamos of fifty lights each, General Electric make; two dynamos, Western Electric make, of fifty lights each; seventy miles of wire, 206 double arc lamps of 2,000 candle power each. They operated last year 206 lamps at a total cost of $10,301.56, or $50 per lamp yearly, making $4.17 per month, or 13 cents per night. These lamps have been run 2,555 hours during the year, a daily average of seven hours. The original cost of the plant in 1887, for seventy-five lights, was $17,986.12, and the total cost of said plant to January 1, 1897, is $51,460.48, and the total cost of operating same to January 1, 1897, is $77,288.23. In figuring the cost of lights, viz., $50, no account was taken of any interest on investment, neither did they figure such items as taxes, water, etc. Their lighting plant is run in connection with their water-works, using three shifts of firemen and two engineers."

SEPARATION OF NATURAL GAS FROM WATER.

This city is now supplied with natural gas from artesian wells, but we are unable to separate more than half the gas from the water. Would you kindly give us information as to how we may separate or get all the gas? *John H. McCord, Auditor.*

Practical men at work with natural gas recommend separators made by William Moor, at Kokomo, Ind., and by Reynolds & Johnson, Anderson, Ind. The latter is perhaps more easily repaired without shutting off the gas.

SIZE OF PIPE FOR SANITARY SEWER.

Will you please answer through your journal what is the usual rule for fixing the size of the pipes in a sanitary system of sewers, knowing the grade and approximate number of persons that will use the sewer; or, knowing the grade and the area covered by the system, allowing for the usual density of city population in a city of 25,000 to 50,000? *J. M. M., Lawrence Junction, Pa.*

If data are obtainable regarding the density of population, the consumption of water per capita and the rate of increase in such population and consumption, they will give the basis for the computation. It is usual to assume that the maximum rate of discharge of this water is such that half will pass through the sewer in eight hours, or all of it in twelve hours. Additions to the amount expected to flow in the sewer on account of flush tanks, ground-water and any special discharges must then be made. It is customary to assume that this combined flow will fill the pipe half full. Tables and diagrams have been constructed based on several formulas for the flow of water through pipes, which give the size of sewers for given discharges and gradients. The most popular formula at present is Kutter's. These tables and diagrams will be found in Latham's "Sanitary Engineering," Staley's "Separate System of Sewerage," Coffin's "Graphical Solution of Hydraulic Problems," and elsewhere. If all or any portion of the storm-water from streets, roofs

or areas reaches the sewer, additions must be made therefor. Fixed rules are very misleading, for they can not take account of all the peculiarities of each particular case. Unless an engineer has had considerable experience in the designing of sewers, or observation of the results of given assumptions in design, he may neglect some important modification of usual conditions in some particular case which will lead to serious error.

REPORTS OF AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

Will you kindly inform me how I can obtain a copy of the report issued by American Society of Municipal Improvements? *C. R. Felton, City Engr., Brockton, Mass.*

D. L. Fulton, superintendent of streets, Allegheny, Pa., is the secretary of the society and will furnish any of the annual volumes of proceedings at one dollar each. The series of five volumes contains a large number of very valuable papers upon subjects connected with municipal improvements and is well worth the price set on it, which is barely equal to the cost of publication.

CAUSE OF A SYPHON BREAKING.

I have a syphon consisting of a one-inch galvanized pipe 400 feet long, with a lift of 26 feet to top of syphon and a fall from top of syphon to discharge of 52 feet. I find after starting that it breaks after running two hours. Can you offer any suggestion as to the best means of making it hold longer? *F. C. Hock, Goshen, N. Y.*

This seems to be a case of too great lift for the size of pipe. The rate of flow of water in the pipe is so slow on account of the small head remaining and the friction in the small pipe that a very small amount of air is necessary to break the syphon. This amount may be drawn from that in solution in the water, and some slight leak may hasten the accumulation of air at the summit. Does the pipe discharge under water? A chamber at the summit which can be filled with water will give a larger reservoir for air and allow a longer period of flow before breaking the syphon. There are ingenious devices for filling this reservoir with water automatically when the syphon is started. Reduced lift for the syphon or increased size of pipe will also help to keep it running.

BY WAY OF COMMENT.

Mysteries of Portland Cement.

In the last number of MUNICIPAL ENGINEERING we published some interesting remarks of Mr. George M. Newcomer on the behavior of Portland cement under certain circumstances. In one case a cement which had been found to be slow setting in Europe was transformed to a very quick setting cement by the time it arrived in America. In view of the experiments which have been made showing the change in rate of setting of Portland cements, it is probably not necessary, in order to explain this behavior, to resort to the theory that the cement became impregnated with something during the voyage. The fact that in years past we have used foreign Portland very extensively has prevented our observing the changes in rate of setting that frequently take place in Portland cement soon after its manufacture. Dr. Tomei found that one sample of cement which required four hours to begin to set when fresh, began to set in

ten minutes when three months old and returned to its normal state when nine months old. The same cement when treated with one-half of 1 per cent. of plaster of Paris began to set in thirty minutes when five months old, but required five hours at the age of one year. Similar results have been obtained with American Portlands.

As to the question of replacing coarse particles of cement with sand grains it has long been known that this may be done without decreasing tensile strength, especially when tested neat. The grains of cement that will not pass a "180 mesh screen" have practically no cementitious value, though if tested separately they will show a slight cohesion which is due largely to the fine floury particles that adhere to the coarser grains. If these coarse grains are replaced by sand it is simply a question whether the fine cement passing the screen will adhere to the sand grains as well as to the coarse cement particles; sometimes it will. But had Mr. Newcomer tested the fine cement alone, he might have found it to give a lower tensile strength than either the original cement or the cement and sand mixture. This would be the probable result, especially if he allowed the mortar to harden for several months.

Limitation of Paving Assessments. There have been several decisions by various courts on the question of the relation of assessments for city improvements to the value of the lot, all agreeing practically that the property can not be taxed in excess of the actual benefits received from the improvement. The question to be settled in each case is the amount of benefit accruing to the property. This is not easy to determine in every case. For example, a street-pavement passes a lot fully improved and one with no improvements. It is an expensive pavement and the assessment on the unimproved lot, by frontage, is nearly or quite as much as the assessed valuation, but is a comparatively small percentage of the value of the improved property. The only difference between the lots is that one has a public-spirited owner who improves his property, while the other has an owner (perhaps non-resident) who is holding it that the "unearned increment" in its value may become as great as possible before disposing of it. The value of his property is increasing on account of the improvements made by his neighbors, and not on account of any act of his own. Public policy would seem to demand that this lot should pay as much in proportion to its frontage on the street (or its area, perhaps) as the improved lots. The ratio of improvement can not be said to depend upon the ratio of values of lots, for these values depend as much upon the betterments as upon the lots alone. The improvements on some lots are adding to the values of the vacant lots, and it is unfair to require them to pay a greater

share of the cost of the street-pavement. This would actually be imposing a penalty for making improvements on lots, and would be paying premiums to selfish, non-progressive speculators for keeping their lots unimproved.

Only very exceptional local conditions can justify such restrictions as one in force for some time in St. Louis, limiting the cost of improvements in any one year to one-fourth the value of the property. This limits the improvement by the smallest, poorest and least improved lot on the line, even though a good pavement, costing even more than the lot, would increase its value several hundred per cent. It seriously delays progress in many poorer districts.

There are cases where expensive improvements have been forced through for the benefit of favored contractors or city officials, whose cost was greater than their value or any benefit they can do the property. These are outrages, not to be considered in the same class with bona fide improvements. They are frauds and should be treated as such. To attempt their restriction by a rule which will at the same time restrict legitimate improvements is unfortunate and unnecessary.

Distribution of Sewer Assessments.

The distribution of sewer assessments is even more complicated than that of street assessments. A certain proportion should usually be borne by the city at large. That portion to be assessed directly against the property, if assessed according to benefits, must be considered in several lights. The general benefit for street drainage and on account of facilities for making sewer connections is common to all and should be assessed in proportion to frontage, or area, or a combination of the two. If all property on the street is devoted to the same uses, the amount of use of the sewer will be approximately proportional to the amount of betterments on the lots, and can be assessed in proportion to cost. Here comes in the question of the unimproved, or partly improved lot, and gives rise to an objection to this method of procedure, for, as in the case of the paving assessments, the well improved lots would be assessed a penalty for progress and the backward owners would have their assessments reduced as a premium on their greed.

The uses to which the property is put also modify the use of the sewer and would call for a distribution of a portion of the assessment in proportion to the amount of waste water, measured with sufficient accuracy, perhaps, by the amount of water consumed. The element of uncertainty here is the permanency of present uses of the property. A few years may see very radical changes in the proportional use of the sewer.

The uncertainties in estimating future uses of property justify the elimination of all the grounds for

variation in assessments except those based on frontage or area, especially if the drainage district or city at large assumes a reasonable share of the cost, so as to make a portion of the assessment depend, ultimately, on value of the property.

It is seldom that sewer assessments are a very large proportion of the value of the property, unless some peculiarity of the law or some miscalculation of rates causes the property on the line of a large outlet to pay more than its share of such outlet. Most suits for excessive sewer assessments arise on this account and have valid grounds for reduction. The reduction should be made, however, more on the ground of inequality of assessments on different lots in the district than on the ground of small actual benefit.

Ingredients of Concrete.

Mr. L. C. Sabin gives us an article in this number upon the proportions of cement, sand and stone in a yard of concrete which is a valuable addition to his article upon the ingredients of cement mortar in the February number. Many engineers test the materials in use on the work under their charge and change the proportions of ingredients from time to time to suit the varying conditions, but there are many men in charge of work who follow blindly some adopted authority, to whom Mr. Sabin's article will be of great value because it gives the principles upon which the determination of proportions is based, and a definite program of procedure to be followed in testing given materials.

A point in his articles requiring emphasis is the condition of the materials when measurement is made.

The cement occupies materially less space in the original package than it will occupy when emptied into a mixing box. The amount of increase in volume will depend upon the manner of emptying the original package and spreading the cement.

Dry sand will occupy less space when shaken or rammed into its place than when lightly shoveled. Water added to the sand to the point of saturation may still further reduce the volume occupied by the sand. If the sand is moist it will occupy more space when shoveled into the mixing box than it would if dry, and it can not be shaken down to occupy the same space as when dry, though it can be thoroughly compacted by ramming. In a private letter Mr. Sabin states that his experiments and those described by M. Feret show that the addition of 2 to 5 per cent. of water to a given volume of loose, dry sand will cause an increase in volume of 10 to 30 per cent. when the moistened sand is stirred up and again measured loose.

The volume occupied by the stone will depend upon the manner in which it is handled, the uniformity in size of the particles of stone and their shape.

Mr. Sabin's article clearly states

the consideration to be given these facts. Special attention is called to them because many engineers, inspectors and contractors pass them by as having little importance. The two articles referred to show that they are of material importance and that their neglect may lead on the one hand to serious reduction in strength of concrete, and on the other to added cost without corresponding benefit. An article in this department, on page 173 of the March number, entitled "Economy of Cement Mixtures," may be of interest in this connection.

Important Points in the Problem of Water Supply.

Mayor Ashbridge, who has just assumed his position in Philadelphia, takes up the water supply question at once, as the most important matter now under consideration, and he takes it up in a very business-like way. He apparently sees the financial impossibility of attacking the entire question at once, and has begun upon the matters which have been shown to be most necessary and feasible. He presents ordinances for repairs and reconstructions amounting to a quarter of a million or more, to fill the most pressing needs of the system. The water waste problem is attacked in a very diplomatic way, which promises to lead to a satisfactory diminution in the consumption of water within a reasonable time. The ordinances presented call for a large increase in the water rates for types of water-closets which are most likely to cause continuous waste and for close inspection of factories and other places where waste is suspected, the director of public works being given authority to restrict this waste, the method being left to his discretion. These two have been considered to be the chief causes of the ruinous consumption of water, but the propositions to restrict the use of water by factories and to make a wholesale introduction of meters have been very unpopular. The proposed ordinances will give an opportunity to correct the most flagrant abuses in the manner best applicable to particular cases and will thus educate water consumers to a more favorable opinion of general restriction of waste. Ordinances imposing appropriate penalties give effect to the provisions quoted.

The mayor proposes to submit the problem of water purification to an expert commission composed of the director of public works, the chiefs of the bureaus of water and surveys, and three acknowledged experts in sanitary engineering. The commission will probably be left free to recommend whatever system of securing pure water it deems most practicable. The views of most of those mentioned in connection with membership in the commission are, however, favorable to filtration in general.

For the first time there seems to be a business-like effort to solve the problems presented and to utilize the engineering talent of the city

departments, the data that has been gathered, the work that has been done in developing various propositions, and expert service in the special lines requiring it, under competent direction and one responsible head. It is to be hoped that the city councils will approve of the mayor's propositions and give him the necessary authority to proceed on the lines he has laid down.

Pittsburg Water Supply. The director of public works in the city of Pittsburg does not take so advanced a stand on the question of the purification of the water supply for that city as that taken by Philadelphia's mayor. While he considers that the commission, whose report was recently presented, has done excellent work and presented a most valuable report, he considers the fact that no typhoid germs have been found in the city water supply to be sufficient evidence that it is not necessary to take immediate steps to clarify the water supply. The case is certainly not so urgent in Pittsburg as in Philadelphia, but the former city may well take a lesson from the experience of the latter and begin the labor of protecting and purifying its water before the pollution becomes serious and difficult to manage. Clarification, such as is proposed for Cincinnati, is very desirable, and filtration with sufficient thoroughness to remove bacteria is becoming more necessary each year.

The problem of restriction of consumption is quite important in Pittsburg. It may be found possible to supply water directly from the river to manufacturing districts, especially to the large mills which use large quantities, and restrict the use of clarified or filtered water to residence and business sections. Waste in these sections must be stopped.

As the cost of supplying pure water increases the necessity of reducing the amount of water that must be subjected to treatment increases, and the demand for meters or equivalent provisions for restricting waste increases. The next ten years will see a material change in public opinion on this question.

Home Rule for Cities. The constitution of the state of California now has a provision which could be inserted in the constitutions of other states with great advantage. It prescribes the method of changing a city charter and provides that at intervals of not less than two years the charter may be amended if the proposed amendment is ratified by three-fifths of the qualified electors voting at the general or special election at which the amendment is presented, and if the legislature approves thereof. The provision completely eliminates the charter tinkering which forms so large a part of the business in the legislatures of some states where large cities are located, especially when the city is not in the hands of the same political party as the state, and also when the party strength in city and state

are so near the same that manipulation of the city is resorted to for its political effect. The power of the legislature to modify the charter is removed but it still has the power to veto procedure on the part of the city which it considers unwise or ill-timed. Some may contend that the city electors under the manipulation of politicians are not to be trusted with so important a matter. A comparison with manipulated legislatures is not materially to the advantage of the legislature. The city elector has the advantage of voting upon his own concerns, and he is not legislating for persons in whom he has no interest or for a corporation to which he may have an antagonism, and a feeling that he can reward friends or punish enemies without reference to the effect upon others.

We have as good government in our cities as we really want, but the outlook will be more hopeful when the character of that government is entirely within the control of the citizens and education and experience will have direct effect through the votes of the people. We will not then have the difficult task of convincing both the legislature and the voters, and getting them into the same mind at the same time.

The legislature, under the California provision, still has a salutary check on the demagogue who misleads the people for a time, and this power will be wielded in a more judicial spirit, since that body is not so closely connected with the actual power of change.

Modern Relations of Architects and Engineers.

The modern conditions of much of our building construction have materially modified the relations of the technical men required in design and supervision. Formerly the architect was able to take care of all the problems arising in the construction and equipment of buildings, with perhaps occasional consultation with engineers or experts in special lines of equipment, and the aid which good contractors can give. Modern developments have vastly increased the interest of the engineers in buildings and it is now almost impossible for the architect to be sufficiently expert to design and supervise the architectural features, the steel frame, the plants for transportation, heating, lighting, ventilating and communication, water supply and drainage. The modern large building is really an engineering structure and the architect is needed mainly to give the artistic touch to the utilitarian structure which is practically designed by the engineer or in the engineering division of the architect's office. The adaptation of the building to the uses required of it can be made as readily by the engineer with training and experience in this line as by the architect. The strictly engineering features must usually be turned over to him if economy in design, construction and maintenance is desired.

It is now time to change the former relations and place the responsibility for the building upon

the engineer, giving him authority to call in a consulting architect to determine the strictly architectural features. The new methods of construction have been in use for so short a time that there is no fixed mode of procedure. The greatest successes have been made by architects who were at the same time reasonably good engineers, by firms of architects with an engineer in the partnership, by architects or firms having an engineering department in charge of a competent engineer, or by engineers or firms of engineers in similar connection with architectural talent. All other large building design and construction is done under difficulties and with greater or less losses to owners by reason of faulty design and insufficient supervision.

When the owner gains sufficient confidence in the capacity of the engineer to change the ordinary custom, and place the engineer in responsible charge of the design, construction, and perhaps the maintenance of the building, he will find many difficulties will vanish, and many expenses will be diminished or eliminated.

A recent paper by architect H. S. Bradlee, of Boston, before the American Institute of Architects, upon the engineering assistance required in equipping the building, touches also on that necessary in designing the frame. It is largely taken up with a statement of the difficulties met with under the present system and a discussion of the fees which should be charged. This latter point is the one which will doubtless interest the owner most.

The author begins by saying that the engineer should adopt the architect's scale of charges, which would demand a commission of five per cent. on the cost of the construction under his charge. He then shows, conclusively, that the building should be under the responsible charge of a single person or firm, and that the work and the responsibility of this firm are so great that the commission here should be five per cent. He thinks this person should be an architect. Obviously, the commissions on nearly all the equipment of the building and on the frame work will thus be doubled and the owner will thus be paying ten per cent. for design and supervision on all of the structure but the strictly architectural features, which are now mainly the artistic and decorative features.

Few owners are willing to pay such commissions, and will accept the plans and specifications of contractors instead, because the apparent cost of them is little or nothing. The author shows clearly that the owner is deceiving himself here, and that he really loses much more than the five per cent. in the additional cost of plant, defective construction, or increased cost of operation on account of defective designs. He also concludes that all the engineering work of the building is best taken care of by a single firm of engineers.

Suppose, now, that the owner

places the building, design and construction in the hands of the engineering firm in the first place, and assume that commissions remain the same. We then have the engineering work designed and supervised by the responsible firm at the cost of a single commission. A consulting architect will be called upon for a design of the architectural and decorative features and the architect and engineer will consult together and modify their respective plans until a unity of architectural and engineering features results. Here a double fee will be called for, since the architect is in such case subordinate to the engineer and should be selected or approved by him. The architect must therefore have the fee prescribed by his schedule and the engineer must have compensation for his supervision, design and responsibility.

The proportion of the cost which is subject to this double commission is quite small, however, instead of being nearly the whole cost of the building. We have the additional great advantage that the supervision of the construction is under the direct charge of the responsible designer without the intervention of a subordinate designer.

When the inertia of old customs is once overcome the engineer will be the responsible head under whom such constructions will be placed and he will call upon the architect for consultation. The day for this will be hastened if engineers will take steps to secure a closer organization of the profession and a stronger feeling of brotherhood with its members. Even the comparatively slight organization of the architects produces very valuable results.

Data on Asphalt and Brick Pavements in American Cities.

We wish to call special attention to the table of information on asphalt and brick pavements presented in this number and prepared by Mr. Samuel M. Gray. In some respects it is the most satisfactory table that has yet been prepared and makes many comparisons between cities and between the two materials comparatively easy and satisfactory. For example, the cost per square yard is reduced to a comparable basis for most cities, if certain well-known differences in condition are borne in mind, such as freight haul and diversity of surface. Where much grading must be done in the same contract with the paving the price per square yard must be increased. Special information must therefore be asked for in such cases, which no table can give. The omission of data on widths of pavements leaves one element of uncertainty where all work is included in the price. A column for average width of street would aid here if the average were the weighted average and not the average for the contracts let without reference to lengths of street. Reference to cost of pavements is omitted, with the exception of cost per square yard of construction.

A very important question is the

cost of repairs. This question is one which cities are beginning to ask with insistence, but thus far the data are not very complete. If each inquirer after information calls for the data it may be possible to arouse interest enough in the cities expending their money for this purpose to induce them to keep proper records. Statements of yards of pavement in use, average age, cost, cost of repairs annually, and average cost per square yard, would soon become valuable and interesting. The present table gives no information on these points.

The relative popularity of the two materials included in the table and others can be estimated without much trouble; also, the most popular methods of laying, but the relative durability of the various pavements is not considered.

There is great diversity in the periods of guaranty of pavements, five years being the most popular, doubtless on account of the influence of the asphalt companies in the past in favor of this period. In computing average cost of repairs, all streets yet under guaranty must of course be omitted from the consideration.

It will take a number of trials to enable us to secure the data on cost of repairs, and it is hoped that future inquiries will include questions on this line. A large part of the discussion of pavements at the Washington meeting of the A. S. M. I. was on this point, and the growing interest in it was clearly shown. It is regretted that Mr. Gray did not add this line to his list of questions.

Uniform Reports for Cities. The desirability of uniformity in reports on municipal works is shown by the enormous amount of duplication of effort, to say nothing of postage, clerk hire, stationery and printing, in securing data each year. An example at hand is the admirable detailed report on methods and amount of construction of asphalt and brick pavements, prepared in January, 1899, by S. M. Gray. When this is compared with the table prepared in 1897, by the committee of the A. S. M. I., it is seen to contain much more information and in far greater detail, the latter report containing only the statistics of amount and cost of pavements of various materials laid in 1895, 1896 and 1897.

Mr. Gray's table contains reports from 49 cities and the committee report from 122 cities. Only 26 cities are in both tables. The smaller number in Mr. Gray's table is partly accounted for by the greater detail required, few cities being able to comply fully with the request for so much information. It may also happen on account of a smaller number of requests. The committee asked for data from 420 cities, and received reports from 144, of which 22 had no pavements.

No two circular letters call for the same information or in the same form. It is quite impossible for

cities to keep their accounts in such shape as to be able to answer all the questions that are asked. If there were a central bureau of information in a department of the United States government, intrusted with the collection of such statistics, requests for information concerning municipal activities could be directed there and would receive prompt and fairly accurate replies for little or no individual expense. At present public-spirited men or committees are the only gatherers of such information and they must go to considerable expense of time and money, with much duplication of each other's work. Much information becomes old in a very few years and must be gathered anew. Many important questions are left unanswered, or assumptions (frequently unwarranted) are made because time, money or inclination to secure the necessary data is lacking.

The Committee on Municipal Data of the A. S. M. I. recommended an information bureau to be connected with the next census, and if possible with a permanent census bureau, and suggested some standard forms for reports of municipalities on water-works, paving, sewerage, lighting, garbage disposal, etc. These forms were printed in the November and January numbers of MUNICIPAL ENGINEERING and criticisms of them were asked for that they may be as valuable as possible when they come to the next meeting of the society for adoption. Copies of the forms can be obtained by any one interested by addressing Charles Carroll Brown, chairman of the committee, at Bloomington, Ill.

A central bureau may have some difficulty in securing reports at first, but annual requests for the same data in the same form will shortly influence a large majority of the cities to adopt forms of account which will make it easy to answer the questions. Advantages to the cities as well as to other inquiries will thus result.

OBJECTIONS TO MUNICIPAL OWNERSHIP OF LIGHTING PLANTS.

A committee of the Ohio Gas Light Association has prepared a report which undertakes to show that municipal ownership of public service industries is a mistake. The report, somewhat condensed, is as follows:

Promoters of this movement are actively at work in every civilized country. Its source is found in the philosophy of a class of thinkers who believe the private ownership of property to be immoral. The objective point of their teaching is the establishment of a social commonwealth in which interest, profit and private property will be unknown. Their method is to encourage any and every proposal that tends in the direction of their object, and only to reveal their entire program to those who are in full sympathy with them. Municipal ownership is regarded as the first step towards establishing a socialistic commonwealth. In reality, the movement, therefore, is an attack on all ownership of private property, instead of being simply an attack upon public service corporations, as a very large number who are in sympathy with the municipal ownership idea erroneously suppose. It is essential that this fact shall be pressed upon the attention of the conservative property owning classes of this country, and that they be called upon to defend their rights to own property by defeating any and every measure that may tend in that direction.

The success of the socialist propaganda lies in its political instead of its economical aspect. The work of stirring up antagonism

between employes and employers, between the poor and the rich, of encouraging prejudices, envy and hatreds in every possible way is being ceaselessly performed. Every party opposed to the existing order for any reason has been deftly inoculated with the virus of socialistic ideas, some going much further than others; but the first step of declaring in favor of municipal ownership has been taken in the platforms of the socialists, populists and democratic parties, and it is a part of their program to make this an issue as far as possible in every municipal campaign. With this end in view the "Municipal Ownership Review" of Los Angeles, Cal., and the "Municipal Ownership Bulletin" of Chicago, both weekly publications, are connected with regularly organized leagues or committees engaged in making a house to house canvass, distributing literature and organizing cliques to get possession of public meetings and control primary elections for the promotion and adoption of the demand for the municipal ownership and operation of all public utilities. The best way to deal with this political movement is to deal with it from the taxpayer's point of view and show that it is economically unsound.

With popular information and sentiment in its present condition it is impossible for those identified with public service corporations to get an impartial hearing. Politicians can make capital in no surer way than to gain the prestige of being good corporation fighters; but if it is clearly shown that their representations are unreliable they may be prevented from carrying their proposals into practice.

So far as known, in every instance where there has been a proper investigation made by capable and impartial engineers, accountants, or business men, to determine whether or not it is better for a municipality to embark in the lighting industry, by owning and operating a municipal lighting plant, or to contract with an existing private company, the verdict has been in favor of the private company. Confirming this statement the following citations are given:

In 1897, Mr. Horace A. Foster, an expert electrical engineer and accountant of Buffalo, N. Y., made an investigation of the municipality owned electric lighting plants in the cities of Batavia, Dunkirk and Jamestown, New York, for the information of the council of Tonawanda, N. Y., which had under consideration the question of erecting a municipal electric lighting plant or entering into a contract with the Tonawanda Lighting and Power Company.

Mr. Foster visited each place, examined the plants and went through the reports for several years. His conclusions were as follows:

"Recapitulating the results shown for the three cities, we find the cost per lamp hour to be:

Batavia, plant in water works, average for two years	$.0223
Dunkirk, plant in water works, average for four years	.0251
Jamestown, average for two years	.0215
Proposal of Tonawanda Light and Power Co	.05

In July, 1898, Mr. Wesley Sears, a member of the council of Jackson, Mich., made an investigation for the information of the council. His findings are as follows:

Municipal Plants.	Cost per lamp hour.
Allegheny, Pa.	.0177
Aurora, Ill.	.0284
Bay City, Mich.	.0222
Detroit, Mich.	.0236
Easton, Pa	.0270
Elgin, Ill.	.026
Jamestown, N. Y.	.0181
Kalamazoo, Mich.	.0274
Newark, O.	.0166
Braintree, Mass.	.0309
Chicopee, Mass.	.048
Danvers, Mass.	.0411
Marblehead, Mass.	.022
Middleborough, Mass.	.033
Peabody, Mass.	.0209
Reading, Mass.	.0627
Wakefield, Mass.	.0702
Jackson, Mich., contract with private company	.0173

In December, 1898, a committee on lighting streets, composed of the Board of Aldermen, of Springfield, Mass., after making a most careful investigation of the subject, reached the following conclusions:

"Owing to the large amount of money that the city would have to pay for the purchase of a plant and to the large depreciation on electrical machinery, together with the fact that the city will be in a position next spring to make a very favorable contract with the electric light company, your committee is of the opinion that it is not advisable to enter into such (a municipal) undertaking."

In December, 1898, the Board of Light Commissioners, composed of four members, prominent citizens, one an ex-mayor, created by ordinance of the Council of Zanesville, O., for the purpose of investigating the subject, reported as follows:

"The commissioners have sought to satisfy themselves of the advisability or non-advisability of establishing a municipal electric light plant from the standpoint of the citizen taxpayers, and have been forced, by a settled conviction and unanimous judgment, to advise against it."

The city of Detroit has made a most praiseworthy effort to prove the efficiency of the municipal ownership and operation of an electric lighting plant. To do this, according to the official report for June, 1898, $790,145.73 of taxpayers' property had been mortgaged to secure funds to invest in the plant. The plant is used exclusively for street lighting, and has 1,744 lamps in operation. The brilliant success at first claimed for this plant had turned to a dismal failure.

On the basis of cost, as reported, plus depreciation at 5 per cent., and allowance for accident insurance of all kinds, it cost the city of Detroit to operate each of these lamps, for the year ending June 30th, 1898, $93.80. The contract price charged by the local company for one lamp, same candle power, operated same number of hours per year, is $92.95. This is 85 cents per lamp less than the municipal cost.

In the light of this result, what compensation are taxpayers receiving for the money they have invested.

The annual report of the Department of Electricity, city of Chicago, for the year 1897, contains a statement that, "Previous to August 5th of this year the city maintained a repair shop, where all repairs were made for fire alarm, police telephone and electric light systems. The maintenance of this shop proved to be quite expensive, and it was con-

sidered advisable to discontinue the repairs on police telephone and electric light apparatus and let the work by contract. * * * Low prices were secured for the repairs, and a net saving per month of $570.71 has resulted."

In the light of this statement it is not strange that Governor Altgeld does not commence at home to illustrate the great advantage to be derived from municipal ownership.

It is fair at this point to ask the taxpayers of Chicago, if so much can be saved by closing a small municipal repair shop and contracting for the work, how much may be saved by making an operating contract with a responsible business corporation to operate the Chicago municipal electric lighting plant? An investigation of this problem is in order.

But we can go on without talking of home affairs. Let us examine English romance a little.

In an electrical journal, published in London under the title of "Lighting," for July 7th, 1898, there is printed "A table of costs, being an analysis of the accounts of the electricity supply works established under the provisional orders in the United Kingdom by local authorities." This table contains the names of forty-nine municipalities that own and operate an electric light plant. Of these forty-nine companies, twenty-four show a surpluse and twenty-five a deficit. Of the thirty-six private companies only two failed to show a surplus.

In August, 1898, a ten years' public lighting contract was negotiated between the city of Boston and the Boston Electric Light Company. The following is an extract from the official letter transmitting the contract to the city council:

"I took up the subject of the electric lighting of our streets and parks and its reasonable cost with an open mind, and with no fixed views as to the relative economy and advantage of having such lights furnished by the city itself, from a municipal plant, or by a private company. My attitude upon the general question of the extension of municipal functions and public ownership is such that I have at least had no prejudice whatever against the proposition, which has been somewhat doubtfully advanced from time to time, that the city should avail itself of the authority given by law, under certain conditions, to do its own public lighting. * * * But I still desired to secure all pertinent information, and to give all due weight to evidence in favor of the policy of direct municipal lighting, particularly in view of its adoption by one or two large cities. I had also decided that * * * I would not take the responsibility of renewing the contract with the Boston Electric Light Company unless satisfied that the rates to be charged were fair and reasonable, as the contract could be allowed to run along without a renewal for any definite period.

"The collection of comparative information as to the cost of electric light in other cities was undertaken by the Boston Electric Light Company at my suggestion, and ex-Mayor Matthews was selected, with my approval, as a thoroughly competent person to make the investigation. While his work was performed as a special counsel for the company, I believe that it has been done carefully and conscientiously, as well as ably and the facts and figures presented by him in his report speak for themselves. After carefully considering its contents myself, the City Engineer went through it at my request, and reported to me that from independent investigation of his own he saw no reason to doubt the correctness of the facts stated, nor to question the conclusions. * * *

"I have every confidence that the workings of the present agreement will be found satisfactory, that the stability which it gives to the relations between the company and the city will prove beneficial to both, and that under it our public electric lighting will be furnished at least as cheaply as it could be through any other arrangement.

"The agreement was carefully examined and approved as to form by the city solicitor before its execution, and he also advised me that I had full power to enter into it on behalf of the city. Respectfully submitted.

JOSIAH QUINCY, Mayor."

The foregoing shows conclusively that whenever municipal accounts are investigated to establish the true cost of operating electric lights by municipal plants, a private company can afford to take a contract at this cost, all economic differences in local conditions being fairly adjusted, for lighting its own town.

The unreliability of municipal bookkeeping and reports has been certified to by every person, committee or board that has ever made an impartial, thorough and extended examination of them. On this aspect of the question the following extract from official reports are submitted:

"We found the answers received from municipal plants very unsatisfactory, and we must say in some cases inaccurate, as the answers received from one city were very different on the two circulars sent and we were advised that on four requests for information similar to our own no two were alike. This arises principally from the way in which the cost is figured, but the result is very unsatisfactory and misleading.

"After closely comparing the tables of the private and the municipal plants we found that the only true way to compare the two was to find out the candle power received for one cent. There are several items that must be considered before deciding the matter on the figures received. One—and a very important one—is the cost of coal; of the cities giving information we have found that the eleven private plants paid more than 50 per cent. more than the eleven municipal plants. This fact alone would more than make up the difference in cost per candle power. Another important factor is labor, and while we have no official figures, from private information we are advised that that is also much higher. Another item is the fact that only a very few of the municipal plants have made any allowance for depreciation, and those that have allow only from 1 to 5 per cent., which is far below that allowed by most private plants. Only six of the plants allow anything for interest on money invested, while ten do not."

The Board of Light Commissioners, Zanesville, O., report:

"As a preliminary step the board framed a circular letter and directed same to various cities and towns through the central, western and southern states, known to have introduced municipal electrical lighting, asking definite and specific information, as to the cost of arc lights of 2,000 candle power, as to the length of time the city had owned such a plant, the number of arc and incandescent lights in use, with detailed estimate

of the actual cost of maintaining such arc and incandescent lights, figured to embrace every expense incidental to maintaining and operating such a plant, including interest on investment and depreciation of plant; what kind of fuel used and cost of same; the labor account per twelve months, the cost of light when the corporation bought it from commercial companies; the original cost of plant complete; the amount of improvements or repairs on the plant after its induction, whether run on all night or moonlight schedules, together with any other information that they might deem useful, either in favor of or against municipal ownership; and whether or not, in their opinion, it would be for the best interests of the taxpayers that the city own and operate its own light plant.

"To these circular letters the board received eighty-two answers, from various towns and cities situate in the states of Ohio, West Virginia, Pennsylvania, New York, Indiana, Illinois, Iowa, Kansas, Missouri, Michigan, Wisconsin, Kentucky, Georgia and Texas, which answers were filed with the clerk of the council.

"On careful examination of the various reports from the various municipalities, we found such a wide divergence in the conditions and incompleteness in estimates that but little aid was afforded. There was no uniformity in the various reports in the candle power of arc and incandescent lights, the arc lights ranging all the way from 1,200 to 2,000 candle power. Some towns and cities adopted the midnight, some the all-night and some the moonlight schedule. The cost of fuel varied from $1.20 to $4 a ton. Many of the towns and cities figured nothing for interest and nothing for depreciation, and none of them figured anything for casualty; some ran in connection with water works; some kept no detailed account of expenditures; some omitted original cost of plant, and many of them improvements and annual repairs. The commission found it impossible to run a parallel between the various towns and cities as to the cost of municipal lighting or the difference in cost between municipal and commercial lighting, and was unable to form any definite judgment based upon the information afforded as to the desirability or practicability of adopting the system of municipal lighting. The great majority of towns and cities recommended municipal lighting. Some of them condemned the systems; others qualified their recommendations by proviso if the system could be kept free for political influence, or could be honestly and economically managed under corporate control, the system could be recommended. Others stated that they had adopted municipal lighting, but they would not if they had not."

From this review correct deductions may be made as to the best methods of opposing the municipal ownership movement:

1. By showing property owners that the attack is in reality upon them, and that taxpayers must make good all deficiencies when costs are understated.

2. When a company seeking a renewal of its contract is confronted with a proposal to install a municipal plant, it should offer to renew its contract at a price that will represent the cost when fully stated under municipal ownership in towns of similar size, all difference in local economic conditions being properly valued and allowed for. To establish this cost, no reliance should be placed on published reports from either side. An expert engineer and accountant, or a committeee of reliable business men, should be employed to investigate and report on conditions as they may exist at the time. If this work is done by appointees of the council, although the company may pay for it, it will be more satisfactory to the public than if done by the company, and will cost no more. It should not be difficult to agree with the city council on the selection of one or more men to make such an investigation, whose ability and honor will not be questioned by either side. A contract secured under such circumstances can but be satisfactory to both parties, and will stop all agitation for a municipal plant.

3. Every opportunity for promoting the demand for unifom system of municipal bookkeeping, prescribed and audited by the state, should be utilized to the fullest possible degree. When such a system is properly established and administered in any state, so that full and true costs of all municipally owned and operated industries are shown in the state reports, the public service corporations of the state in the same industries will have an unquestioned guide by which to determine their prices. This will induce competition between the two systems on a proper basis, which cannot fail to be a benefit to both. If the theory is correct that a business management is more efficient than a political management, corporations ought to experience no difficulty in earning a satisfactory profit when selling service at municipal cost.

4. A proper state civil service law, applicable to every municipality, is desirable on general principles, and it is especially desirable where municipalities are to have their functions enlarged. Great stress should be placed on this fact, and any grant of power to municipalities increasing opportunity for political patronage should be opposed until a strictly regulated civil service has been permanently established.

Your committee thinks it fortunate that thus far the growth of municipally owned industries is almost entirely with water works and electric lighting plants. There are very few municipal gas plants and no municipal street railroads in this country. The leasing of the Philadelphia gas works to a private corporation has given a severe shock to the advocates of municipal ownership. It may be confidently asserted that the longer the lease is operated, the less will be the desire of the people of Philadelphia to have it abrogated.

It may not be amiss in this connection to close this report with the closing paragraph of a paper, read before this association at its meeting in Toledo, March, 1890, by Allen Ripley Foote, which is as follows:

"The policy of municipal ownership of lighting plants can be successfully combatted on practical lines. Let the whole truth be known regarding the accounts of such plants; let the people become thoroughly educated as to the workings and tendency of such undertakings, and, speaking of one plant as representing the whole, the sale of the Philadelphia gas plant to private ownership and management will become a political necessity."

C. R. FABEN, JR.,
F. R. PERSONS,
JEROME PENN,
A. P. LATHROP,
E. P. CALLENDER,
Committee.

PERSONAL INFORMATION.

JONES—The far-reaching possibilities of the best solution of the problems of municipal government are not taken into account in the usual discussion of such questions, and only a few men who have been placed at the head of municipalities in America have shown either full appreciation of or capacity for rendering the great service that can be given to the public through the position of mayor. There is today broader opportunity for great public service in the office of mayor of a large city than is afforded by the powers of the more exalted office of governor of a state. The position of mayor is more closely and effectually in touch with the affairs which vitally involve public welfare. An interesting figure among progressive mayors of American cities is Samuel M. Jones of Toledo, who, although opposed by a formidable combination of local powers, was last month re-elected as an independent candidate, receiving about 17,000 out of 24,000 votes. He is a champion of the people, who preaches to them the doctrine of brotherhood, who seeks to advance their interests by persuasive means and whose course in all things, public and private, is governed by the rule, "Do unto others as if you were the others." A recent article in the Chicago Tribune said of him: "He is a Christian sociologist, who makes practical the principles of his belief by infusing them into his every-day dealings with men. He says of all men, 'these are my brothers. If we are all children of our heavenly Father, what other relation than brotherhood between man and man can there be?' He believes in the absolute equality of the employe and the employer, and he demonstrates this belief by frequently throwing open his beautiful home to his employes and their families, and inviting his aristocratic neighbors and friends to assist in entertaining them. A year ago he purchased a bit of land adjoining his factory and employed a landscape gardener, who transformed the square of waste land into an inviting little park, with cinder paths winding among grass plats, and flower beds under fine old trees. The mayor then fitted up the beautiful place with seats and benches for the older people, and with swings, seesaws, Maypole, tennis court and various games for the children. Then he set the gates wide open and invited the poor people, whose hours of recreation are few, to come with their families and enjoy it all. He named the place Golden Rule park, and every pleasant Sunday afternoon throughout the summer hundreds of people gathered there to enjoy the program of a good orchestra and short addresses by well-known educators and philanthropists on sociological and educational topics of interest to the audience. During the summer of 1897 over 20,000 people attended the 'Pleasant Sunday Afternoons' at Golden Rule park. Even the little ones who assembled there were taught to put into practice the golden rule. Along the fence is painted in great white letters: 'Children, don't keep the places when others are waiting any longer than you would want others to keep you waiting.' The mayor is something of a poet and he wrote a little song on his pet scheme, the eight-hour day. Mrs. Jones set the words to catchy music. The mayor had it published and distributed copies among the people who frequented the park. It is entitled, 'Divide the Day,' and most of the children know it far better than they do 'America.' "

Mr. Jones, as mayor of Toledo, has advocated many progressive ideas, among which in his last message were a city natural gas plant, a municipal lighting plant, home rule for cities, the application of the merit system to city employes, no grant of franchises without first submitting the question to a vote of the people, the publishing of city directories by the municipality, the improvement of streets, an eight-hour day, the substitution of canes for the clubs formerly carried by policemen, parks and public entertainments, public baths, free employment agencies, etc. An interesting story of the life of this interesting man and an impressive expression of his views on public questions, as given by himself in response to a request, follows:

"I do not know that there is anything in my personal history strikingly different from the history of thousands of my fellow-countrymen. Neither is there anything different in my thoughts of social and industrial questions from the thoughts of thousands of others. The opportunity has come to me to carry out and put into practice some ideas that, as Heine says, 'have taken possession of me and are forcing me into the conflict,' whether I will or not. I hope no one will give me credit for having an extra stock of goodness or anything of that sort. I have done what I have done simply because I could not help it. All of us live up pretty closely to our convictions, and I have done nothing more. In fact I have not begun to realize the ideals that I had in mind, and my best efforts are mere apologies when tested by my ideas of what is really and justly due my fellow-men.

"Glancing briefly at the past I can see some influences that have led to the belief that I now hold as to my relation to my fellow-men. I was born in Wales, Aug. 3, 1846, came with my parents to America when I was three years old, and I have often heard them tell of the tedious voyage

of thirty days in an emigrant sailing ship and the subsequent voyage over the Erie canal to central New York, where they finally settled in Lewis county. My parents were very poor and very pious. The poverty in our family was so stringent that it was necessary for me to go out and work, and I bear upon my body today the marks of the injustice and wrong of child labor.

"At the age of eighteen I neard of the opportunities in the oil regions in Pennsylvania, and at once made my way to Titusville. I landed there with 15 cents in my pocket, and without an acquaintance in the state. For three days I went through one of the most trying experiences of any young man's life—living without money and seeking work among strangers. I had promised to write to my mother, and I used hotel stationery to fulfill my promise, but was without the necessary 3 cents then needed to purchase a postage stamp. This was one of the hardest financial problems of my life. I overcame it through a clever dodge. Seeing a man on the way to the postoffice with a bundle of letters in his hand I inquired of him: 'Are you going to the postoffice?' Yes, sir,' he said. 'Will you have the kindness to mail this for me?' at the same time pushing my hand into my empty pocket in search of the necessary coin, fumbling my pocket knife and keys a moment. The gentleman kindly said: 'Never mind; I will stamp it,' and the revenue was provided which took my first letter to my mother.

"But I was on the right track. I was in a land of opportunities. I soon found work and a business that was to my taste; a business, too, that the good Providence has removed in part at least from the domain of the competitive destroyer—the business of producing crude petroleum from the earth.

"Since 1870 I have been more or less of an oil producer. In 1886 I came to the Ohio oil fields and began in the business of producing oil at Lima. Since that time I have followed it both in Ohio and Indiana and to some extent in Pennsylvania and West Virginia. In 1893 I invented some important improvements in appliances for producing oil, and, finding manufacturers unwilling to make the articles, fearing there was nothing in it, I concluded to go into the manufacturing business. This brought me in contact with labor conditions in a city for the first time in my life. As a rule, labor in the oil fields had enjoyed large wages compared to similar classes outside. I found men working in Toledo for the fraction of a dollar a day. I began to wonder how it was possible for men to live on such a small sum of money in a way becoming to citizens of a free republic. I studied social conditions, and, looking on the inequality and injustice around me, led me to feel very keenly that something should be done that would be a protest against the degradation of my fellow-men, and I at once declared that the so-called 'going wages' rule should not govern the Acme Sucker Rod company, which is the name our business took. I said rather that the rule that every man is entitled to such a share of the product of his toil as will enable him to live de-

SAMUEL M. JONES, MAYOR OF TOLEDO, OHIO.

cently and in such a way that he and his children may be fitted to be citizens of the free republic, should be the rule governing the wages of our establishment. I soon discovered that the men were lacking in something else besides wages. There was a shyness on the part of the men when I spoke to them. The fact that the men were conscious of social inferiority was painfully apparent, and I could not understand how a man who had done no wrong could or should feel inferior to any other man simply because he worked with his hands. Without any organized plan for the purpose or without hardly knowing myself what I was doing I determined that no such feeling should exist, and that in some way it must be overcome.

"I am a thorough believer in the preamble of the declaration of independence 'that all men are created equal' and I believe that the republic cannot permanently endure unless we make conditions that will create such equality as was contemplated by the founders of our government. To break down the feeling of social inequality we adopted the best possible method. We began to 'get together'—that is, we had little excursions down the bay. We invited our workingmen and their families, and also some other people who live in big houses and who do not work with their hands or with anything else, for the matter of that, some of them. We sought to mix them, to let them understand that we are all people—just people, you know. By the word people I mean just what Lincoln did when he made use of the same word, as he did so frequently and with such good effect.

"As our business increased we took in new men. We made no special effort to select. There was always plenty of 'out of works,' as there will always be while present conditions exist, willing and waiting for us to allow them the rare privilege of making wealth for us. We asked no questions as to their habits, their morals, their religion or their irreligion. We were ignoring the sacred rule of business, getting along in a sort of free and easy way, occasionally giving the boys a word of caution printed on the pay envelopes. Then, perhaps, a little letter expressing good will and fellowship. Then we came to feel the need of a rule to govern the place. We thought to that extent we ought to be like other people. So we had the following printed on a piece of tin and nailed to the wall. It's there today:

"'The Rule Governing This Factory—Therefore, whatsoever ye would that men should do unto you do ye even so unto them.'

"We told the boys that this was a double-acting rule which to be carried out required that they should do their work as they would want us to do if they were working in the office and we in the other end of the shop. After nearly three years of a test I am pleased to say the golden rule works. It is perfectly safe and is worthy of a trial. It is nearly 1,900 years since Jesus gave it to the world, and I think the least His professed followers can do is to try it.

"In 1895 at Christmas time we made a little cash dividend, accompanying it with such a letter as we believed would be helpful. In 1896 we repeated the dividend and the letter. In 1897 we did the same. We have invited the workingmen to an evening party at our big house. Why shouldn't we? The labor of their hands provided the money to build it, and it seems to me that they ought to have the privilege to come and look at the pretty things the wealth they have helped to provide has produced. We expect to have them with us often, and even this I regard as a sort of an apology, at best.

"If just conditions prevailed I think the men who produce the wealth of the country could be permitted to enjoy more of it than they now do. It is gratifying to me to say that the cash dividends that have been paid to our workingmen have no kind of a comparison in my mind in value to the dividends of more precious material that they have and are devoting to the employers—the precious dividends of their love and affection. Henry D. Lloyd says that 'wealth will remain a secret unguessed by business until it has reincorporated itself under the law which counts as the property of each one the total of all the possessions of all his neighbors.' And I want to testify to the manufacturers and business men of the country, to the millionaire and multi-millionaire, that the dividends that are filling their coffers, the idle wealth they are storing in their treasury vaults, is mere dross that will be and is as worthless ashes in their hands if it is bought (as it is, much of it) at the price of the sacrifice of the lives of beaten men and women and even little children who have been robbed of their play and childhood.

"In the spring of 1897 we purchased a corner lot adjoining our factory. It had about a dozen beautiful trees and some old rookery buildings. We cleared off the rookeries, filled, graded and sodded the ground, equipped a part of it as a playground for children, putting in swings, seesaws, croquet grounds, and a Maypole that has been a perpetual delight to their little lives and threw the place wide open to the public. Just the people, you know. No 'Keep off the grass,' no fences and no rules. It was a most popular resort all of last summer. Only a small bit of ground, but mothers would go there with their babies and sit in the shade of the trees while their children would go miles around the Maypole. Others would take their knitting and sit and visit, and then on Sunday afternoons we had our meetings and get-together times. Not preaching meetings or Sunday-schools for just a few, but meetings for the people and all of the people. We had talks upon topics of general interest—brotherhood, man's relation to man, the golden rule, socialism, transportation, and kindred topics were discussed by people of varied phases of religious belief. At one time we had a Christian minister, a Jewish rabbi, and an agnostic discussing from the same platform the subject of the golden rule.

"It seems to me that I see the beginning of a better day when this declaration of our forefathers shall be realized. Selfishness, and greed, and love of money, grown rampant, have well-nigh consumed us, but the people, the great people, the patient, loving, waiting people, are thinking as they never thought before, that the reign of the people is about to begin. The right of every man to live who is willing to work must be admitted. The ideal of the republic, which we

find in the well-ordered family, must be realized and that soon, if the nation is to be saved and the republic is to be permanent. I believe we are coming to this realization at a tremendous pace. The machinery which does the work of the world in one-quarter of the time or less than was formerly required to do it has made it both unnecessary and impossible to provide ten or twelve hours' work for all of the people. The people will not willingly starve or commit suicide. They have a right to live because they are willing to work. The Almighty Himself promised it at the very dawn of creation, when He said, 'In the sweat of thy face shalt thou eat bread.'

"In our selfishness and greed we are robbing the worker of the fruit of his toil. We have deprived the man of the right to live. This right he must and he will have, and I feel more confident than ever that relief is coming and coming quickly. I see it in the discontent and unrest that are widespread and increasing. I see it in the threatened disintegration of great political parties. I think I can see that the rule of the people is about to begin. God grant that it may come.

"I advocate the eight-hour day, not because it affords a final and complete solution of the labor problem, for it does not. It is only a step in the right direction, but its immediate adoption would put thousands of men now in enforced idleness at work at once, and we may as well admit, those of us who claim such superiority as to style ourselves 'Captains of Industry,' that these men are our brothers and in one way or another they will live. Through our selfish, greedy and soul-destroying policy we have driven millions into beggary and thousands into crime, so you see when we follow the effect to its logical conclusion and then turn around and look for the cause of crime, we often find the real criminal very near our own door.

"People ask me what I would do if we had the eight-hour day universally adopted and then there was not work enough to go around? I reply: Divide the day, again, and then, if there should still be unemployed men, divide the day again. This is a perfectly logical, rational and reasonable program. That's why I wrote the song, 'Divide the Day,' because I believe in it, and the simple rules of arithmetic will demonstrate that it must be a success.

"For me to be contented with existing conditions would be to blaspheme the sacred name of Christ, and moreover would be treason against the republic itself. I know the republic cannot endure and our mock Christianity must perish from the face of the earth unless those of us who claim to be both patriotic and Christian are able to demonstrate by the sacrifice of service that our claims are well founded by redeeming our beloved country from the cruel grasp of selfish greed that would destroy and make it what God designed it should be—a haven for the oppressed of all the earth This we can only do by or through the realization of brotherhood, and even organized greed in the form of the trust and monopoly is aiding on the glorious work. They are teaching society a valuable lesson. They have ceased to destroy each other, therefore they have combined in a brotherhood (?) and turned their attention to plucking the people. Let the people be wise. Let us enlarge the present idea of the trust and monopoly until it shall take us all in on the basis that every man who is willing to work has a right to live. When we have that done we can close up our charitable institutions and most of our prisons and work houses, for then, and not until then, will we have brotherhood which will be the perfected republic realized. With all due respect for other people's opinion to the contrary, I see no hope for social peace and industrial prosperity for all of the people short of the realization of this 'dream,' and much more. Very faithfully yours,

"S. M. JONES."

New Municipal Officers in New Jersey.

Municipal officers have been elected in New Jersey, as follows:

Newark—Board of street and water commissioners, Harrison Van Duyne, George M. Ballard, Carl Valentine Baumann, Chas. F. Herr and Jos. M. Bryne. Of the common council five were re-elected, as follows: Jas. O. Smith, W. B. Garrabrants, John Buhl, jr., J. H. Bachelior and Frederick V. Ruland.

Kearney—Councilmen, Robt. Lord, Jas. Allen, Walter Laffey, Richard Veale, Geo. M. Eckard, Wm. Hungerford, Jas. J. Donnelly and C. H. Silliman; town clerk, Theodore C. Wilderman.

Ocean Grove—Mayor, Wesley C. Smith; councilmen, Wm. K. Williamson and Arthur D. Barrows.

Bordentown—Mayor, Dr. J. S. Gilbert, re-elected; president of council, F. H. Lee; councilmen, C. E. Burr and J. O. Kane.

Jersey City—Mayor, Hon. Edward Hoos, re-elected; members of street and water board, Ferdinand Heintze and John Sullivan.

Hoboken—Mayor, Hon. Lawrence Fagan, re-elected; water commissioner, Henry Eggert; councilmen, Richard Greten, Peter H. Kessler, Jas. Londrigan, Andrew Hopper and Oscar Fromm.

Bayonne—Mayor Seymour, re-elected.

Englewood—Mayor, Elbert A. Brinckerhoffer.

Trenton—Mayor, Frank O. Briggs.

Passaic—Mayor, Hon. Charles M. Howe, re-elected.

Asbury Park—Mayor, Hon. Frank L. Ten Broeck, re-elected; council, Jas. A. Bradley and G. W. Treat.

New Brunswick—Mayor, Dr. Williamson, re-elected; aldermen, Wm. B. Davis, Leslie Johnson, Andrew Zahn, Fred Tappen, Frederick A. Hendricks and John J. Harkins; freeholders, Arthur O'Neill, Paul Leffert, Joseph Denizer, Jas. Dougherty, Frederick W. Miller and Jeremiah Donovan.

Paterson—Mayor Hinchliffe, re-elected.

Vailsburg—Mayor, Geo. A. Smith; aldermen, Emil Haines and F. G. Reynolds.

Caldwell Borough—Mayor, Samuel H. Brown; councilmen, Wm. W. Worthington and Frederick Heller. Caldwell Township—Township clerk, Henry F. Harrison; surveyors of highways, Jas. H. Cadmus and Frank Lawrence.

Personal Notes.

G. B. Pike has been appointed city engineer at Kalamazoo, Mich.

William C. Haddock has been appointed director of public works at Philadelphia, Pa.

J. Dwight Brady has been elected district engineer of Fall River, Mass.

H. K. Bishop has been appointed superintendent of public works at Hudson, N. Y.

C. W. Hoitt has been appointed a member of the park commission at Nashua, N. H.

Robert H. Moth has been elected city engineer to succeed J. B. Davidson at Kenosha, Wis.

J. Ross Robertson, who has been city engineer of Ft. Madison, Ia., has been eletced city engineer of Keokuk, Ia.

William Johnstone has been appointed village clerk, to succeed Louis F. Murray, at Dobbs Ferry, N. Y.

Charles J. Poetsch has been chosen to succeed George H. Benzenberg as city engineer at Milwaukee, Wis.

A. J. McPherson has resigned his position as town engineer and water works superintendent at Galt, Ont.

P. E. Peters has been appointed superintendent of sewers to succeed Capt. A. A. Kane at Natick, Mass.

G. H. Swan has been appointed superintendent of water works to succeed Henry Keller, at Niagara Falls, N. Y.

Orley Rose has been appointed chief engineer to the water board, to succeed F. C. Norcross, resigned, at Lorain, O.

Col. W. Nalle, who has been with his regiment the greater part of the time since Jan. 1, 1898, has returned to his home in Culpeper, Va.

John B. Hawley, M. Am. Soc. C. E., has been unanimously re-elected city enineer by the mayor and city council of Ft. Worth, Texas.

Harrison R. Van Duyne has resigned from the engineering force of Newark, N. J., and will go into business with his father, Harrison Van Duyne.

J. Frank Clark has been appointed superintendent of the water works and fire department to succeed Hiram E. Hardy, resigned, at Big Rapids, Mich.

Walter Frick has resigned his position as city engineer at Carbondale, Pa., to take charge of the engineering work of the Crystal Lake Water company.

The following have been elected superintendents of water works: Arthur W. French, Hyde Park, Mass.; C. A. Hoffnagle, Vergennes, Vt.; William Moran, Titusville, Pa.

John R. Bass, superintendent of the clay mines of the Ottumwa Brick and Construction company, Ottumwa, Ia., was crushed to death recently in a fall of shale at the mines.

George L. Wilson of the city engineer's department, St. Paul, Minn., addressed the members of the Commercial club of that city April 20 on "Our Pavements; Present and Future."

Dr. John T. Nicholson has resigned his position as professor of mechanical engineering in McGill university to become the head of the mechanical and electrical engineering departments of the Municipal Technical school, which is being established at Manchester, England.

Prof. J. B. Johnson, M. Am. Soc. C. E., sailed for Europe April 15, where he will spend four months studying commercial and industrial schools. Prof. Johnson will, on his return, assume charge of the college of engineering of the University of Wisconsin, Madison, Wis.

Water commissioners have been elected as follows: J. E. Meagher, Burlington, Vt.; W. F. Bauer, Springfield, O.; H. C. Brown, Gallipolis, O.; A. Stewart, Toronto, O.; B. B. Childs, Dayton, O.; J. E. McGowan, Steubenville, O.; Arthur Fenner, Ayer, Mass.; Chas. A. Rice, Brookfield; John W. D. Fifield, North Brookfield; Lyman R. Eddy, Webster; A. G. Pease, Spencer.

City engineers have been elected at the following places: N. C. Phillips, Council Bluffs, Ia.; W. M. M. Maxon, Waukesha, Wis.; John N. Wolfe, Lancaster, O., re-elected; August Bobme, Kewaunee, Wis.; H. M. Redd, Chilicothe, O.; F. A. Coleman, Rome, N. Y.; J. E. S. Pryor, Hagerstown, Md.; L. M. Hastings, Cambridge, Mass., re-elected; William Peach, Pueblo, Colo.; J. B. Hunter, Denver; Mr. Burwell, Durango, Colo.

City clerks have been elected at the following places: M. Weber, St. Joseph, Mich.; Richard Chaddock, Benton Harbor, Mich.; Percy Cochrane, Eau Claire, Wis.; William L. Kerr, Green Bay, Wis.; F. J. Olle, Kewaunee, Wis.; Daniel Witzel, Oshkosh, Wis.; Henry Schroff, Racine, Wis.; C. L. Toan, Big Rapids, Mich.; W. J. Smith, Cadillac, Mich.; Elmer E. Hymers, Pontiac, Mich.; H. O. Van Eyck, Holland, Mich.; Thos. Kirby, Grand Haven, Mich.; Asa G. Milton, Greenville, Mich.; Cassius Mishler, Lansing, Mich.; Henry Lardner, Niles, Mich.; City Clerk Ash, Owosso, Mich., re-elected; Henry Taylor, Manistee, Mich.; J. H. Squires, Topeka, Kas.; S. S. Wyanelt, Abilene, Kas.

William Taylor has been elected engineer of the board of water commissioners at Tarrytown, N. Y.

CURRENT INFORMATION.

An Instance of Damage by Electrolysis.

A report on electrolysis has been submitted to the gas and water companies of Indianapolis by E. E. Brownell of Dayton, O., who has been making an investigation of the matter for the last three months. The street railroad company uses the single wire system, discharging its used current through the rails in an effort to carry it back to the power house. The rails serve the purpose of returning the current poorly, and it leaks away, and, reaching the metal pipes of the gas and water companies, passes through them for various distances. The pipes of the water company are connected with the street railway lines in order that the current may be returned through them, on the theory that little injury will be done. Mr. Brownell has designed a chart, showing the dangerous electrical condition of the gas piping system where the

current or a portion of the current is leaving the pipes for the rails or other piping systems, especially the water pipes. Where the current is leaving the pipes for the rails is an extremely dangerous condition, but where the current is leaving the pipes for other piping systems is not so dangerous. The street railway company, in using the water pipes for their chief return, thus compels the gas systems to turn over all their current, or most of it, to the water system. "In plain words," Mr. Brownell says, "the street railway company is using the water system to destroy the piping system of the gas companies, which is intended to cover up the actual state of affairs electrically for which the street railway company is wholly responsible." He points out that the gas piping system is in a dangerous condition over a large area—about three times that of the water system in the natural gas system, and about four times that of the water system in the artificial system. This deterioration between the gas piping systems and the water system is slow, yet it is sure to develop into serious trouble and should be stopped at all hazards, for wherever a water pipe meets a gas pipe the latter, with few exceptions, gives what current it has gathered to the water pipe, at the expense of the metal in the gas pipes at those points. The electrical readings show that the gas piping systems are of a higher potential than the water system, making the gas systems positive to the water system.

Whenever gas pipes come in close proximity to the water pipes, including the service pipes of both systems, they are bound to give what current they have gathered to the water pipes, thus causing electrolytic action. Owing to the large number of service pipes that the gas companies have upon the streets that are occupied by street railways, and that lie beneath the rails, at a closer distance than that of the water company's piping system, are the reasons why these systems are gathering more current than the water system in diverse parts of the city.

The larger the pipe the slower the deterioration; for instance, a one-inch pipe will deteriorate 2.25 times that of an inch-and-a-half pipe, or, in other words, inversely proportional to the square of the diameter, all other conditions, both electrically and physically, remaining the same. If it were not for the good quality of the soil this trouble would have manifested itself ere this time, in vast proportions, as the wrought-iron pipes, if not molested by of soil, as is characteristic of the city, would, beyond the shadow of a doubt, last a full lifetime or more, giving little or no trouble; as for the cast-iron mains, no man could tell how long they would last.

Mr. Brownell suggests the entire removal of the electrical current from any piping system to entirely remove the liability of electrolytic action beyond a doubt. He says:

"It is absurd to think of controlling a current of electricity after it has been discharged into the ground, to return the best it can, when miles of large pipes offer it an easier path than the one that is provided, with the current changing from one piping system to another, or rails, as the case may be, leaving its path of destruction upon each system as it leaves that particular system as a part or whole of the current. Under no condition have I assumed any theoretical adventure in stating the above named suggestions alluded to. It is the opinion of the best non-prejudiced electrical engineers today, who are working for this reformation, which must come sooner or later as an absolute necessity for the combined protection of life and property, directly and indirectly, as a natural consequence."

Water Meters Advocated in Minneapolis.

The special committee appointed by the water works committee to investigate the great waste of water in the city of Minneapolis, Minn., reports that one-half the total amount pumped into the city passes through pipes back to the river without use. The consumption of water in different cities is cited as follows:

London, 31 gallons per capita.
St. Petersburg, 33 gallons per capital.
Hamburg, 44 gallons per capita.
Dublin, 46 gallons per capita.
Providence, R. I., 56 gallons per capita.
Fall River, 35 gallons per capita.
Atlanta, Ga., 58 gallons per capita.
Dayton, O., 52 gallons per capita.
Lincoln, Neb., 45 gallons per capita.
Lawrence, Mass., 56 gallons per capita.
Sioux City, Ia., 29 gallons per capita.
Quincy, Ill., 31 gallons per capita.
St. Paul, 47 gallons per capita.
Minneapolis, 106 gallons per capita.

The committee recommends, as the only definite way to reduce the waste of water to a minimum, a complete meter system; that the ordinance governing the use of this certain destroyer, and lain in this class city water be so amended that the committee on water works would have the right to install the meter system, and that the system first be adopted in all of the commercial districts of the city, and be gradually extended so as to embrace the whole city; that all meters should be owned, set and maintained by the city, a small rental for the meter based on the cost and life of the

same, being charged. The committee believes that the better system would make new pumps unnecessary. Frank T. Moody and John H. McConnell compose the committee.

Extras Cannot Be Paid for If Not in the Contract.

The supreme court of Indiana handed down a decision April 4 on the liability of a city for extras on sewer contracts. The case was that of the city of Huntington vs. John F. Force et al. The court holds that, except so far as funds arising from the collection of assessments or the sale of bonds may come into its possession, a city is not liable to the contractor for any part of the cost of a sewer constructed under the Barrett law. Unless he can show that they were furnished in pursuance to and in accordance with his contract, a contractor connot recover for extras. There is no statute giving a city authority to incur a liability for work done and materials furnished in the construction of an improvement to be paid for by assessments on the property benefited, in excess of what is called for by the contract.

The Columbus Storage Dam Project Enjoined.

Judge Evans decided, April 14, in the Columbus (O.) storage dam project, holding that the dam cannot be built under the specifications now on file in the city engineer's office; that before it can be built, the proposition must be submitted to the state board of health; that when the people of a city vote on a certain proposition to do certain work, no municipality or board of public officers can change the voice of the people, and do something not voted on. The injunction will remain in force and in all probability will be made perpetual.

A Cloud on Greater New York Franchises.

Controller Coler of New York City is of the opinion that the decision of the court of appeals in declaring invalid the contracts entered into between the various municipalities merged into "the Greater New York" and lighting and water companies, will affect contracts amounting to $700,000 a year. He is of the opinion that many of these contracts were obtained in a questionable manner and it would not be difficult to prove fraud in some cases.

Cannot Bathe in Water Supply Streams.

The decision of the lower court has been affirmed by the higher court, at Rahway, N. J., in the prosecution of Dr. Charles Smith of Rahway, for bathing in Lawrence brook and polluting the water supply of New Brunswick. Dr. Smith conducted a cold water cure sanitarium along the Lawrence brook, and patients were in the habit of bathing in the brook, which Dr. Smith termed the "fountain of youth. The attention of the board of health was called to the practice and he was prosecuted. Judge Strong, on Jan. 27, 1898, fined him $75 and costs of $67.97. This sentence has been affirmed by the higher court and the appeal dismissed. Dr. Smith claims to be 125 years old and attributes his old age to the preserving qualities of Lawrence brook.

How a Michigan Contractor Works in Frozen Ground.

A Michigan contractor has applied the principle sometimes used in sinking driven wells through suitable soil, to the making of holes for poles in frozen ground. He applies steam pressure through a pipe to the spot melting the frozen soil and forcing it out of the hole. The steam is generated in a portable boiler. The connections are such as to permit the necessary motions without leakage and the pipe is forced down into the earth by men at the ends of an attached horizontal wooden bar ten feet long. About thirty holes a day can be dug in this way.

Michigan Court Holds That Highways Are Not Built for Wheel Riders.

The Michigan Supreme Court has rendered a decision to the effect that the state laws do not require townships, cities and villages to keep highways in safe condition for bicycle riding, and that the duties of the municipality cease with maintenance of safe roads for other class of vehicles.

Taxes Are a Prior Lien.

Judge Thayer of the United States circuit court of appeals filed a decision, April 10, in which he upholds the tax laws and gives to the state about $60,000 in taxes levied on the property of the Duluth gas and water company, at Duluth, Minn. The Central Trust company of New York, trustee, brought suit in the circuit court for the foreclosure of the mortgage on the plant. The state intervened and claimed the amount due for taxes, and the circuit court held that the state could not collect the taxes. When the suit to foreclose the mortgage was begun the sheriff of St. Louis county levied on the gas and water mains of the company for taxes unpaid for 1894-95-96, amounting to $37,088.30. When taken to court the sheriff was enjoined from selling the property under the execution, as it was covered by the mortgage. The state intervened in order to attempt to force the payment of the taxes. The property was

STREET CLEANING UNDER MORELAND'S "ORDERLY SYSTEM" ON CASS AVE., DETROIT.

sold Feb. 5, 1898, for $700,000 and the master in chancery in charge of the case reported that the state had no prior lien for taxes. The circuit court confirmed this report. The state appealed the case with the result that Judge Thayer holds that the lien of the state for taxes is a prior one and must be paid out of the proceeds of the sale of the property of the company under foreclosure. Since the beginning of the litigation the taxes for 1897, amounting to $23,569, have been assessed against the property.

A New Law in Illinois Providing for Municipal Ownership.

A bill, authorizing cities, incorporated towns and villages to acquire, construct, maintain, operate or lease heating, electric power, electric lighting and gas plants, has passed the Illinois legislature. The bill provides that such cities, incorporated towns and villages may borrow money and collect a general tax in the same manner as other municipal taxes may be levied and collected; and may go beyond their territorial limits, and may take hold and acquire property and real estate for the location, construction and maintenance of any public utility in the manner provided for the taking and condemning of private property for public use; and may acquire and hold real estate and any other property and rights necessary for the location, construction, maintenance and operation of any such plant by purchase or otherwise. All the income received for such plants shall be kept in a separate fund, and shall be first applied to the payment and discharge of the cost, interest on bonds or money borrowed and used in the purchase or construction and running expenses of each plant. Any surplus may be applied in such manner as the common council or board of trustees may elect.

Who Should Pay for Street Repairs.

All cost of repairs upon paved streets must be against adjoining property, according to the city attorney's interpretation of the city charter of Omaha, Neb. The cost of repairing has, heretofore, been paid out of the general fund of the city, and the new assessment plan will undoubtedly meet with objection from the property-owners. A question has been raised as to how the cost of these repairs shall be assessed, and the matter has been referred to the city engineer. One plan suggested is to retain the original improvement district that was created when the street was originally paved and assess the cost of all repairs in that district against all the property-owners in it. It is pointed out, however, that this will meet with objection because the property-owners whose pavement is in good condition will not want to pay for the repairing of a pavement in some part of the district that may be blocks away. Another plan is to assess the cost of each repair patch against the property immediately adjoining. The property-owner would vigorously protest against this also. A tax against the property-owners is looked upon generally as unjust, and it is pointed out that the property-owners may not possess a vehicle and therefore have had no part in wearing out the pavement. With this point in view, it is urged that the best way of raising the necessary money to keep paved streets in repair is to establish a vehicle tax, on the ground that vehicles are held responsible for the wearing out of the pavement. City Attorney Connell is of the opinion that if the property-owners are to be assessed for the repairing of pavements they should be given the right to petition for such repairs, and the power to order repairs should be taken away from the council. Consequently, if property-owners are taxed for repairs they will refuse to ask for them, and the result will be that all pavements will ultimately fall into very bad condition.

New Paving Specifications at Detroit.

The new paving specifications submitted to the council committee on streets, at Detroit, Mich., April 10, remove the guarantee for cedar and brick entirely, while that on asphalt is raised from five to ten years, with indemnity bonds. No bill for extras shall be allowed after a job has been accepted. All new curbing will be backed with, as well as laid, in concrete.

Departments Instead of Bureaus Advocated in Chicago.

The necessity of establishing departments instead of bureaus, in connection with the public works of Chicago, is advocated by L. E. McGann, commissioner of public works. He believes that if the public work of the city is properly looked after it is necessary to have responsible heads of the departments instead of mere superintendents of bureaus. The city council is urged to pass ordinances establishing six separate departments—special assessments, streets, sewers, water, general improvements and engineering for bridges, harbors and river improvements.

Expansion and Contraction of Asphalt Pavements.

Mr. A. D. Thompson, city engineer of Peoria, Ill., says in his annual report that the extreme cold of last winter has proved beyond question the need for providing some means of allowing for expansion and con-

GRAND AVE., MILWAUKEE, PAVED WITH ASPHALT.

traction in the asphalt pavements in that climate. As an instance of the effect of the contractive force upon a continuous sheet he says: "Jefferson avenue, from Hamilton to Cornhill, a distance of more than 6,600 feet, is paved with a continuous sheet of asphalt, no attempt being made to allow for expansion or contraction. The best experiments on this point indicate that the asphalt mixture has about the same coefficient of expansion as steel, which, according to government tests as quoted by Kent, is about .0000063891. Assuming the asphalt has a temperature of 100 degrees F. when compacted, and that the extreme winter temperature is 22 degrees below zero, which occurred the past winter, there is a variation in temperature of 122 degrees. With these figures, the pavement on Jefferson avenue would contract so that it was more than five feet shorter in the coldest weather of winter than in the summer, if allowed to move freely. A small portion of this contractive force is exerted in overcoming the friction of the asphalt on the concrete; but the greatest part is exerted in tending to rupture the pavement, and the cohesive force of the mixture must be enormous to prevent the pavement from cracking. An examination of Ravine avenue, where the expansion cracks were placed at intervals of fifty feet during construction, shows that these cracks have not entirely prevented the rupture of the asphalt the past winter. The street is in an extremely exposed position on the east bluff. The cracks opened from ⅛ inch to ½ inch at the crown of the street and narrowed to a fine line at the curbing, thus indicating a much greater strain at the center. The variations in the width of these cracks, as noticed with changes of temperature, would indicate that they have partially fulfilled their object, while the fineness of the lines of the ruptures would show that the cracking would have been much worse without these reliefs. The results encourage a continuation of the experiment."

The Remarkable Record of a Corliss Engine Compressor.

To the Editor of Municipal Engineering:

Sir—We noticed a short article on page 275 of your April number entitled "A Stationary Engine that Beats All Records," in which it was stated that a Corliss engine at the Omaha exhibition ran consecutively for fifty days without a stop. It might be interesting for you to know that we have run a Corliss engine compressor at our ice factory several times for a two months' run without a stop of even one minute, and at one time last summer we made the rather interesting record of three months, twelve days, a total of one hundred and twelve days, at sixty revolutions a minute, without a stop. This, we think, beats your record a little bit more than twice. DIAMOND ICE COMPANY,

Charles Warner, Jr.,
Secretary.

Wilmington, Del., April 21, 1899.

Organization of Landscape Architects

The American Society of Landscape Architects was organized in New York City, April 6. The officers of the association are: President, J. C. Olmstead, of Olmstead Bros., Boston; vice-president, Samuel Parsons, jr., of Parsons & Pentecost, New York City; secretary, Daniel W. Lagton, New York City; treasurer, C. W. Laurie, New York City.

Organization of Indiana Contractors.

The Indiana Street Paving and Turnpike Association met in Indianapolis April 26 and perfected its organization. The association will have a capital stock of $100,000, which may be increased. Of this $23,000 has been subscribed. The company will be incorporated. The home office will be in Indianapolis. It is possible, although not fully determined upon, that a test case of a cash deposit with bond will be instituted at the letting of the contract for macadam roads at Crown Point, May 17. The officers of the association are: President, W. C. Dorsey, Terre Haute; vice-president, C. W. Dunn, Frankfort; secretary, J. F. O'Brien, Cloverdale; treasurer, D. H. Fatout, Indianapolis. The executive committee is composed of Charles Cruson of Scottsburg; M. L. Bolin, Tipton; Riley Phillips, Redkey. The executive committee is vested with all power and all authority to erect independent plants if necessary.

Annual Convention of American Water Works Association.

The annual convention of the American Water Works Association will be held at Columbus, O., May 16, 17, 18 and 19. The program has not yet been prepared, but it is stated that it will embrace some interesting and valuable papers by well-known water works people. The chairman of the local committee of arrangements is Mr. Jerry O'Shaughnessy, superintendent of the Columbus water works. The headquarters in Columbus will be the Chittenden hotel. The officers of the association are: President, J. A. Bond, Wilmington, Del.; first vice-president, William R. Hill, Syracuse, N. Y.; second vice-president, C. P. Allen, Den-

ver, Col.; third vice-president, R. M. Clayton, Atlanta, Ga.; fourth vice-president, L. N. Case, Duluth, Minn.; fifth vice-president, John B. Heim, Madison, Wis.; secretary and treasurer, Peter Milne, New York; finance committee, Dow R. Gwinn, Quincy, Ill.; W. H. Laing, Racine, Wis., and Francis G. Ward, Buffalo, N. Y. It is not improbable that there will be a lively contest over the secretaryship, for which Mr. Dow R. Gwinn of Quincy, Ill., was last year a formidable candidate.

Street Railway Franchise Granted in Indianapolis.

The city of Indianapolis has entered into a contract with the Indianapolis Street Railway company, extending the franchise for a period of thirty-four years from January, 1901, in consideration of an annual payment by the company of $30,000 per year, the sale of six tickets, with transfer, for 25 cents, or twenty-five for one dollar, payment for street paving between and along the tracks, and the company to furnish a first-class service, which must at all times be satisfactory to the city authorities. There was much opposition to the grant of the franchise, but it was ratified by the council by a vote of 20 to 1.

Proposed Municipal Ownership of Street Railways in Detroit.

Under authority of an act passed by the Michigan legislature at its last session a commission headed by Governor Pingree is endeavoring to bring the Detroit street railway lines under municipal ownership. The commission, it is reported, is favorable to paying between $8,000,000 and $9,000,000 for the property, and is making encouraging progress in its negotiations with the owners. Citizens, however, are offering organized opposition to the carrying out of the plans and will, if necessary, try to defeat the project in the courts. The law under which the commission is proceeding confers on the city of Detroit power to acquire and operate the lines. If the undertaking is successful Detroit will be the first city to venture into municipal ownership and operation of street railways.

New Publications.

"The Microscopy of Drinking Water." By George Chandler Whipple, biologist and director of Mt. Prospect laboratory, department of water supply, Brooklyn, N. Y. John Wiley & Sons, New York. 338 pp; price, $3.50.

This book will particularly interest those who have charge of water supplies. It is intended as a guide to the water analyst and the water works engineer. It describes methods of microscopical examination and identifies the organisms commonly found in drinking water. Its avowed purpose is "to stimulate a greater interest in the study of microscopic aquatic life and general limnology from the practical and economic standpoint." It well fulfills this aim so far as the work of the author is concerned. The author draws largely from his biological researches at the laboratory of the Boston water works and from reports of the Massachusetts state board of health, but makes no attempt to summarize the data that has accumulated during the last few years. The organisms described are those most commonly found in the water supplies of New England and those that best represent the important groups of microscopic animals and plants.

Annual Report of the Smithsonian Institution for 1897. S. P. Langley, Secretary.

Among the valuable scientific contributions to this volume are "Electrical Advance in the Last Ten Years," by Elihu Thompson; "The X-Rays," W. C. Rontgen; "Experiments in Mechanical Flight," S. P. Langley; "An Undiscovered Gas," Prof. William Ramsay; "Light and Its Artificial Production," Dr. O. Lummer; "Age of the Earth as an Abode Fitted for Life," Lord Kelvin.

The Sanitary Condition of City and Country Dwelling Houses. By Geo. E. Waring, jr. D. Van Nostrand company, New York.

This is the second edition of the little book containing papers read by Col. Waring before the American Public Health Association over twenty years ago. They have been rewritten in the light of advances made in the practice of house drainage since that time. The preface to this new edition was one of the last things written by Col. Waring.

"Man's Imitation of Nature in Purification of Water," by Dr. Gardner T. Swarts, Secretary Rhode Island State Board of Health.

This pamphlet is issued by the New York Filter Mfg. company, 26 Cortlandt-st., New York, who will send it free on request to any address. In addition to the paper by Dr. Swarts the pamphlet contains much other chemical and biological data in connection with the subject of water purification.

Municipal Reports.

Seventh Annual Report of the Department of Public Works of the City of Peoria, Ill., for the year ending Dec. 31, 1898. M. W. Manning, Commissioner; Almon D. Thompson, City Engineer; James A. Ryan, Superintendent of Streets.

Commissioner Manning states that there has been no street paving in Peoria during the last two years, except on two streets,

owing to remonstrances from property-owners. In 1898 the only work done was in laying sidewalks. The suspension of work is due to the operation of the new local improvement law in Illinois, City Engineer Thompson explains. The law greatly hinders improvement by reason of the complicated proceedings made necessary by it, the numerous opportunities offered irresponsible objectors for delay and the division of jurisdiction between three bodies. Mr. Thompson has completed plans and estimates for paving work to cost about $256,000 and for sewers to cost about $79,000, but much of this work will be abandoned on account of the operation of the new laws. Mr. Thompson advocates an extension of the guarantee period on asphalt pavements to at least ten years. "This provision," he says, "would give a good pavement for fifteen to twenty years at no cost to the property-owners, except the original cost of construction. If the guarantee period in the original contract is limited legally to five years it would be only fair to the people paying for such improvements to maintain the same for the second five years under a separate contract, payable out of the general fund." The city engineer now has a well-equipped testing laboratory, but his work thus far has been limited to tests of cements.

Annual Report of the City Engineer of the City of Minneapolis, Minn., for the year 1898. F. W. C appelen, City Engineer.

This report covers the work done during the last year of Mr. Cappelen's term. The principal work was in paving alleys, which were generally in bad condition. Twelve were paved with brick on concrete foundation and asphalt filler at $1.84 per square yard; three with sandstone on sand at $1.70½; four with granite on sand at $1.89 and $1.91. The brick was laid under a ten-year guarantee, but no guarantee was required on the sandstone and granite. Owing to an irreconcilable difference in the board of public works as to the kind of filler to be used in brick pavements the bids of contractors were rejected and the council ordered the work done by day's labor under the supervision of the city engineer. The brick for this purpose were bought from the Purington Paving Brick company at $15.50 per thousand, under a ten-year guarantee, and Utica cement was used at 82 cents per barrel. The cost, including everything, amounted to about $1.60 per square yard. Sprinkling of asphalt streets was abandoned on some of the new pavements on the advice of the city engineer, and the results were very gratifying. Mr. Cappelen thinks that the streets can be kept clean better without sprinkling and that the water is detrimental to the life of the pavement. The new reservoir of the Minneapolis water works has reduced the bacteria in the water from 25 to 50 per cent., and the typhoid fever death rate has been lowered from 70 to 40 per 100,000 of population.

Sixteenth Annual Report of the City Water Works of Madison, Wis., for the Year 1898. John B. Heim, Supt.

The commissioners decided to conduct the plant on its own earnings, and thus relieve the city from all financial burden connected with it. The year ended with a balance of $4,883 on hand and all bills paid. Besides, many improvements were made. It is calculated that in 1902 all bonded indebtedness on the plant will be paid. In the near future, however, new pumps must be bought. The company, prior to 1897, was paying $243 a year for light. It installed an electric plant at an expense of $587 with fifty incandescent lamps. The total expense of operation for the first year was $37.57, and the interest on the investment amounts to $66.93. It is estimated that in five years $882 will be saved. Mr. Heim regards the use of fire hydrants by street sprinklers as a nuisance and inadvisable. It has been found that they seriously damage the hydrants and cause much trouble in other ways. During the year the use of meters was increased from 2,071 to 2,269, a gain of 198. There are only 188 consumers without meters, and it is expected that with the completion of a new sewer system all consumption will be under the meter system. The expenditure for meters has averaged $17.75 each. The average meter rate collected was 15 2-3 cents per hundred cubic feet and the amount received for unmetered water was 2 4-5 cents per hundred cubic feet, which shows a loss of over 11 cents per hundred cubic feet on unmetered water. The minimum rate is $4.50 per annum and 806 consumers paid this rate. Mr. Heim gives full and valuable data on the operation of the plant.

Thirty-Third Annual Report of the Water Commissioners of the City of Newburgh, N. Y., for the Year Ending March 1, 1899. Curtis Stanton, Supt.

The reports embrace the recommendations of Engineers Van Buren and Garrison for the new supply and improvements in the plant. During the year $6,682 was expended on construction and repairs. The receipts amounted to $61,487, and the balance left on hand was $12,953.

Annual Reports of the City Engineer and Commissioner of Public Works for the City of Syracuse for the Fiscal Year 1898. R. R. Stuart, City Engineer; James H. Meagher, Commissioner of Public Works.

With the close of the year 1899 the center of the city, Mr. Stuart says, will be almost

entirely paved with first-class pavement. Much sewer work is also under way and the engineer recommends immediate work on several important extensions of the system. An apropriation of $25,000 for a new map of Syracuse is about exhausted and the city engineer asks for $10,000 additional. The work will be completed, he thinks, in about two years.

Seventh Annual Report of the Board of Water Commissioners of the City of Haverhill, Mass., for the Year Ending Nov. 30, 1898. D. H. Gilderson, Supt.

The most important work of the year was the building of a new reservoir at Gale's Hill, which will be completed this year. A new pumping station is contemplated.

BAY CITY, Mich.—In his annual report to the council City Engineer Bloomshield says of cedar block pavements: "The material used in street paving has been wood (cedar blocks and board foundation), of which this city has about eight miles at present, involving a cost of $134,842. In order to maintain a good roadway this kind of pavement must be replaced every eight years and after five years' use it is a continual expense, not only for repairs to the pavement itself, but in wear and tear of vehicles that are obliged to travel over it. I believe it is safe to assume that after ten years' use this pavement will cost the city $150,000, or about three-fourths of the total cost of the same area of first-class brick and asphalt pavement."

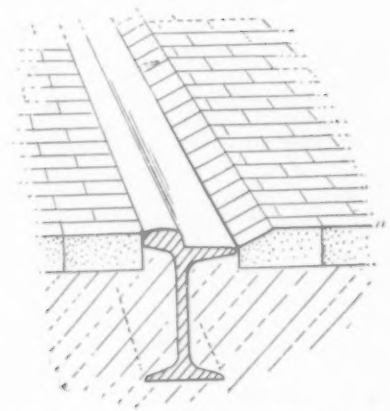
MACHINERY AND TRADE.

Brown's Improved Stop Gate Box.

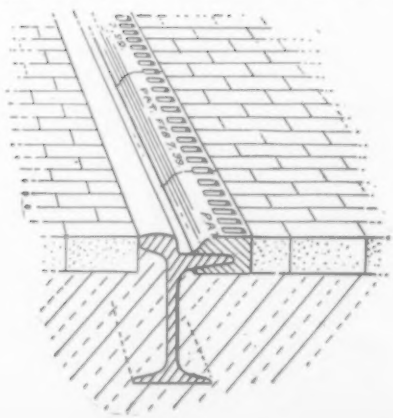
Mr. J. L. Brown, superintendent of the Allegheny water works, has designed a new stop gate which will, it is believed, meet a want long felt. It is made in vertical rings or sections of different lengths to accommodate the various distances from the main to the street surface. Each ring or section is made to fit any ring on which it may be placed, making the rings interchangeable. The top cap is made to fit each and every ring and it is also contracted at the top for a lid of any diameter, lids of eighteen inches in diameter for all up to sixteen-inch pipe being preferable, which allows any part of the valves to be taken out without digging up the street. This is very necessary. A leak can be readily discovered and reached by removing the lid instead of digging around the whole valve, as must be done when the small or cheaper boxes are used. The security offered, together with the advantage of such a casing, is apparent and will more than make up the difference in the price of the cheaper boxes. The standard box in use for sizes of pipe up to sixteen inches are three feet in diameter and four feet high and weigh one thousand pounds.

A New Device for Paving Along Street Car Tracks.

A new device in the form of an iron block, adjustable to tram head girder street car rails, has been invented by Seth J. Buckland of Springfield, Mass., for protecting block pavements along street railway tracks. It is not only designed to give the desired protection to the pavement, but at



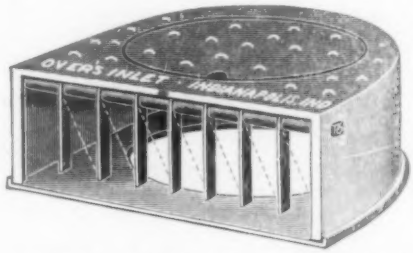
the same time to convert tram head girder rails into grooved rails. It does this without the use of bolts, and practical men who have examined the device strongly commend it. It is stated that the block has re-



ceived favorable consideration in Worcester and Lowell, Mass.; Hartford, Conn., and Geneva, N. Y., where it will probably be put into use in the near future. It is stated that the Boston Paving company will use it in connection with some of their work. A device of this kind has been much needed, and Mr. Buckland's invention appears to meet the requirements. The accompanying illustrations indicate the character and utility of the device.

A New Sewer Inlet.

Mr. Ewald Over of Indianapolis has applied for a patent on a new sewer inlet with swinging bars. It will bear the name of "Over's inlet," and an illustration of it is given here. The bars, under ordinary circumstances, prevent trash from entering the catch-basins, but during heavy storms, when the flooding of adjacent streets is



threatened, the bars will swing back under the heavy pressure of floating substances, thus giving the inlet a much larger receiving capacity than when the bars are rigid. The bars in the Over inlet are only a quarter of an inch thick and 1¼ inches wide and seven inches long, thus presenting a frontage of only a quarter of an inch in width. The bar or bolt holding the swinging bars is bolted onto the main frame of the inlet at the sides or under the top.

Successful Street Sweeping Machine.

The pick-up sweeper manufactured by the National Street Sweeper and Manufacturing company of Cleveland is the combined output of a company which has had many years of experience in street cleaning on a large scale upon the one hand, supplemented by a thoroughly practical knowledge of the mechanical features of the question on the part of the well-known firm who manufacture them, upon the other. The requirements and the obstacles to their attainment were thus approached intelligently and were solved from a practical as well as a theoretical standpoint. An extensive use of the machine during several years past has demonstrated its success. It has never been found an easy task to invent a sweeper which would not be found lacking in one respect or another. The Cleveland machine does several of the things considered most desirable. It picks up a windrow of any size, leaves no trail whatever and dumps direct into the hauling wagon without having been handled by hand at any stage. It is used in connection with a gutter and side sweeper which, preceding it, leaves the dirt in a windrow of varying width and depth. This dirt the sweeper collects and elevates to a bin with a capacity of two cubic yards. When it becomes necessary to unload the hauling wagon is driven alongside, and by means of a simple and ingenious lever arrangement operated by the driver the dirt is carried over and dumped in the wagon by a conveyor, and the sweeper proceeds as before. The operation of unloading consumes between two and three minutes. The machine is best operated by three horses, and in conjunction with the side and gutter sweepers will clean two miles of streets in eight hours.

Sale of a Paving Brick Plant.

The plant of the Carrollton Granite Brick Co., Limited, at Carrollton, O., will be sold by the sheriff on Saturday, May 13. Information regarding the plant is given in an advertisement on the last page of this number. Mr. James F. Lawler, who represents the owners, says the plant is in excellent condition. It is valued at $35,000, but will be sold, it is expected, at a considerable sacrifice. The sale of the property has become necessary because there is no man in the company with the requisite qualifications who will devote himself to the business. Some of the stockholders, however, are willing to remain in the company.

The New Sewer Pipe Company.

The consolidation of the sewer pipe interests is practically assured, and the new combine will be known as the Federal Sewer Pipe company. Salt-glazed sewer pipe, drain tile, terra cotta or fire clay chimney tops, fire clay pipe and chimney linings will be manufactured. The proposed combine will absorb the trade in the only important district in which works are located outside of the St. Louis district. The failure to maintain prices led to the combination.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copes of any patent may be obtained for ten cents.)

621,371—March 21, 1899—Road scraper—Frank Philip, Stockport, N. Y. The diagonal moldboard is supported, at its outer

end, by a small wheel, and the frame is supported by a single flanged wheel.

621,488—March 21, 1899—Dredging machine—H. M. Guild, Erie, Pa. Means is provided for oscillating and for rotating the suction tube.

621,466—March 21, 1899—Bridge—Montgomery Waddell, New York. The swinging lift-span is provided for its axis with an unusually large arc-shaped track which is supported in a suitable arc-shaped cradle.

621,479—March 21, 1899—Aqueduct—C. N. Dutton, New York, N. Y. The side walls are connected by a suspended floor of such form that weight movements are inward.

621,657—March 21, 1899—Roadbed for railways—G. F. Greenwood, Pittsburg, Pa. The roadway, rails, ties and ballast are set within a longitudinal trough, preferably of concrete.

621,680—March 21, 1899—Fireproof building construction—James John, Chicago, Ill., assnr. ¼ to John Hewitt, same place. A floor or ceiling structure consisting of a cealing layer, a metallic fabric imbedded therein, a cellular structure of plastic material, a covering of plastic material, and a metallic fabric covering the cell and embedded in the plastic upper layer.

621,938—March 28, 199—Excavator—A. F. Nime, Philadelphia, N. Y. A ditching machine.

622,372—April 4, 1899—Street sweeper—D. I. Langworthy, Syracuse, N. Y., assnr. 7-10 to L. D. Langworthy, same place, and F. L. Strong, New York.

622,399—April 4, 1899—Machine for tapping water or gas mains—George Shelley, Wilkesbarre, Pa.

622,401—April 4, 1899—Process of treating sewage for fertilizer—F. M. Spence, Manchester, England. Aluminic sulphate, fernic sulphate, and sulfuric acid are added in sufficient quantities to neutralize the alkalinity. The putrescible and fatty precipitates are removed, pressed and dried; then treated with a solvent to dissolve out the fat and fatty acid; then separating the solvent and fat or fatty acid, recovering both.

Trade Notes.

Hazleton, Pa., contemplates the purchase, in the near future, of a stone crusher. A. B. Cellax, cy. engr.

A petition is being circulated at New Berlin, N. Y., asking for the purchase of a stone crusher. Bd. Trustees.

Bids will be received at Nanaimo, B. C., until May 15 for a 12 or 15-ton steam road roller. S. Gough, cy. Clk.

The city of Manistee, Mich., has not yet decided upon the question of purchasing a stone crusher. E. W. Muensch, cy. engr.

The highway department of Queensborough, N. Y., contemplates the purchase of three new steam road rollers.

George E. Currie, Detroit, Mich., has purchased the city plant of the Michigan Stone & Supply company.

A number of city officials of Bowling Green, Ky., are visiting various cities examining road rollers, stone crushers, etc.

The Eastern Paving Brick company, Catskill, N. Y., recently shipped 650,000,000 brick to Kingston, Jamaica.

The Purington Paving Brick company, Galesburg, Ill., is remodeling six kilns, which have been idle for about three years.

The Culver Stone company, Springfield, Ill., has changed its name to the Culver Construction company.

Julius Gobeaux of Minneapolis, Minn., has discovered a bed of clay near the city limits suitable for making brick.

The Spurck paving brick plant at Peoria, Ill., has been purchased by F. R. Carter, of High Cliff, Wis., who will make improvements and add new machinery.

The Paterson Crushed Stone company, Paterson, N. J., has been incorporated by J. S. Sowerbutt, W. K. Berry and F. W. Schmidt.

The California Paving company, San Francisco, Cal., has been incorporated by Joseph Sheerer, Thomas Ganeard and Wendell Easton.

The towns of Coventry and Warwick, R. I., have been advised to purchase machinery necessary for building and macadamizing highways.

The question of purchasing a road roller, a street sprinkler and a street sweeper has not been decided upon by the city of Grand Rapids, Mich.

The question of purchasing street sweepers and street sprinklers is being considered at Norristown, Pa., according to report. S. C. Corsen, boro. engr.

A. J. Swanson, of Lindsborg, Kas., will erect a plant at Salina, Kas., for the manufacture of vitrified brick, building brick and tile.

The Pulsometer Steam Pump company, 135 Greenwich-st., New York City, has been awarded the contract for a pump which is to be sent to Singapore for dredging purposes.

The city of Butte, Mont., contemplates the purchase of machinery in May as follows: One street sweeper, four street sprinklers, four dump wagons. F. C. Bickenbach, cy. engr.

The Fuller Brick & Slate company, Pine Grove Furnace, Pa., is adding stiff-mud machinery to its plant and will manufacture vitrified paving brick in addition to face brick.

The plant of the Lorain Brick company, Lorain, O., has been purchased by Henry Boyden, who will put in improved machinery and manufacture paving, building and sewer brick.

The Municipal Construction company, Chicago, Ill., has been incorporated to conduct a construction and contracting business by W. T. Hapeman, Daniel W. Fishel and William A. Jennings.

The Home Construction company, Lexington, Ky., has been incorporated to lay street paving, curbing, guttering, sewers, repairing turnpikes and highway bridges. The officers of the company are: President, Major John M. Bullock; secretary and treasurer, Ernest Ellis; superintendent, Thomas Smith.

The Gaffney Brick company, Winchester, Ky., has been incorporated to manufacture and sell brick, tiling, drains, etc., by John Gaffney, St. Louis, Mo., and G. W. Holloway and T. G. Stuart.

The Alma Portland Cement company, Jackson, O., has increased its capital stock from $50,000 to $700,000. C. K. Davis is president and F. D. W. Ewing secretary of the company.

The Reynolds Electric Street Cleaning Car company, Phoenix, Ariz., has been incorporated to acquire patents for and manufacture street cleaning devices by A. Jackson Reynolds, Kendall Hunt and Edward L. Sierney.

The Continental Cement company, Trenton, N. J., has been incorporated by Thomas F. Gilroy, New York City; Ralph Beverly, William H. Clark, James C. Young, Jersey City.

The townships in Crawford county, Indiana, contemplate purchasing stone crushers and improving the roads if the county commissioners will not proceed to do so under the new law, according to press reports from English, Ind.

George M. Pierce, 315 American Trust Bldg., Cleveland, O., shipped to the city of Hartford, Conn., April 11, a carload of catch-basin covers, numbering 80. The sewer department of St. Louis, Mo., has adopted the Pierce sewer inlet.

The Star Brick company is the proposed name of a new company that will erect a large plant soon for the manufacture of building and paving brick. George W. Aulman, of the Eagle Iron Works, Des Moines, Ia., is at the head of the company.

J. F. Townsend and other sewer pipe manufacturers of Akron, O., have purchased the large plant of the Royal Clay company, in Uhrichsville, O., which will be put in operation for the manufacture of a line of novelties.

The Fernoltz Brick Machinery company, St. Louis, Mo., has purchased the plant of the Fernoltz Brick Press company, and will continue the manufacture of the Fernoltz improved brick press and the Fernoltz patent pulverizer and other brick machinery. The shops are located at 1214 and 1216 Poplar-st., St. Louis.

The Harrison Construction company, Newark, N. J., has been incorporated to construct and manage public and private works and conveniences of all kinds, including railroads, canals, reservoirs, and gas, water and electric light plants. The incorporators are: Lewis B. Harrison, Charles M. Slocomb and Charles F. King. The principal local office will be at 745 Broad-st.

The City Wastes-Disposal company, 874 Broadway, N. Y., has been organized, with the following officers: President, F. M. Gibson; vice-president and manager, G. Everett Hill; secretary and treasurer, M. E. Stone; engineer, Wm. L. Church. The company is organized from the staff of the late Col. Geo. E. Waring, jr., and will make a specialty of sewage disposal, garbage and refuse disposal and street cleaning.

The annual meeting of the stockholders of the Joseph Dixon Crucible company was held at the company's main office, Jersey City, N. J., Monday, April 17, and out of a possible vote of 7,345 shares, there were 7,069 shares voted for the re-election of the old board, consisting of Edward F. C. Young, John A. Walker, Daniel T. Hoag, Richard Butler, William Murray, Alexander T. McGill and Joseph D. Bedle. President E. F. C. Young, Vice-President and Treasurer John A. Walker; Secretary Geo. E. Long were re-elected by the directors. Judge Joseph D. Bedle was also re-elected as counsel.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Grand Rapids, Mich. — Mayor Perry vetoed, April 18, the contracts awarded recently to the Ayres Asphalt Paving company for paving Jefferson-ave. with asphalt.

Detroit, Mich.—It is estimated that this city will have to expend $2,231,750 before the beginning of 1903 if the pavements are kept in any kind of passable condition.

Pendleton, Ind.—An order from the superior court has been asked enjoining the town board from advertising for bids for the proposed brick paving of a street.

Port Huron, Mich.—Electrolysis has damaged the water mains on Military-st. to such an extent that the brick pavement along the principal business blocks, laid less than a year ago, is in an unsafe condition.

Brooklyn, N. Y.—Concrete strips are being laid along some of the gutters in Flatbush-ave., and some of the wheelmen are of the opinion that they will prove to be better than asphalt strips for cyclists.

Kansas City, Mo.—An ordinance is proposed which provides that contractors shall be held responsible for street paving after the pavement is torn up in the construction of sewers and laying of water mains. A clause in the ordinance states that contractors will be held responsible whether the city permits excavation or not.

Sharpsburg, Pa.—The borough council will pass an ordinance providing for the paving of all streets not now paved. Booth & Flinn, who were awarded a contract about a year ago for $60,000 worth of paving, agreeing to do any additional paving that the borough may want done at the same figures, except asphaltum, which would be at a 5 per cent. advance, will probably feel the effect of this decision, owing to an advance in the price of the material to be used.

CONTEMPLATED WORK.

New Haven, Conn.—Belgian block paving is contemplated for three streets.

Owosso, Mich.—This city has voted to bond for $15,000 to extend the asphalt paving.

Niagara Falls, N. Y.—A resolution has been passed to pave Pine-st. with asphalt.

St. Augustine, Fla.—A petition has been circulated asking that Charlotte-st. be paved.

Hastings, Neb.—Several miles of perma-

nent sidewalks are contemplated this year.

Grand Forks, N. D.—About five miles of paving is contracted for and more is contemplated.

Quincy, Ill.—The city council adopted ordinances April 18 for paving several streets.

Marion, O.—A resolution has been passed authorizing the paving of Charles-st. with brick.

Champlain, Ill.—An ordinance has been passed to pave W. University-ave.; estimated cost, $34,367.

Olathe, Kas.—The paving of Park-st., with vitrified brick or macadam, is contemplated. F. R. Hogg.

Waterbury, Conn.—Estimates will be prepared for paving Bank-st. with cobblestones or brick.

Biloxi, Miss.—This city has voted to issue $25,000 of bonds for street paving. H. T. Howard, mayor.

Youngstown, O.—Spring-st., between Wick-ave. and Holmes-st., will be paved. F. C. Brown, cy. clk.

Spokane, Wash.—Paving is contemplated this year for Main, Sprague, Post, Howard and Washington-sts.

Wilmington, N. C.—The proposition to issue $50,000 bonds for road improvements will be voted on May 2.

Cedar Rapids, Ia.—(Special.)—G. H. Merridith, cy. engr., says that this city will do some paving.

Mason City, Ia.—The construction of two or three blocks of paving in State-st. is urged by the press.

Norwich, Ont., Canada.—Plans and specifications are being prepared for macadamizing Main-st.

Atlanta, Ga.—An ordinance to widen and repave Whitehall-st. has passed. J. J. Maddox, councilman.

Greenville, Tenn.—The improvement of about ten miles of pike roads leading from this city is contemplated.

Danville, Va.—The question of issuing $100,000 of bonds for street improvements will be voted on May 24.

Paris, Ky.—Plans have been ordered for both brick and asphalt pavements in the principal streets.

Athens, Ala.—The question of issuing $100,000 bonds for road improvements will be voted on July 15.

Hannibal, Mo.—(Special.)—A. C. Moetz says that 6,000 square yards of macadam paving on Market-st. is contemplated.

Pomeroy, O.—A resolution was adopted April 11 to pave Butternut, Second and Sycamore-sts. Mayor Seebohm.

Syracuse, N. Y.—R. R. Stuart, cy. engr., has submitted plans and specifications for paving a number of streets.

London, Ont.—The committee has recommended that council ask bids for brick or asphalt paving on Market square.

Parkersburg, Va.—Several blocks of brick paving are contemplated this spring, according to press reports.

Bay City, Mich.—(Special.)—Geo. Turner, cy. engr., says that 50,000 square yards of brick paving on concrete will be constructed.

Paducah, Ky.—The city council recommended an issue of bonds April 10 to pave five blocks of Broadway with brick.

Springfield, Ill.—Subscriptions are being asked for paving Monumental-ave., from N. Grand-ave. to Oak Ridge cemetery.

Jacksonville, Ill.—(Special.)—The contract will be let in May for 16,000 square yards of brick paving on cinders on S. Diamond-st.

Coldwater, Mich.—(Special.)—This city has ordered 10,000 square yards of paving after plans prepared by Riggs & Sherman of Toledo, O.

Wooster, O.—(Special.)—J. L. Eberhardt, cy. engr., says 2,400 square yards of brick paving on stone foundation will be laid on Spink-st. in June.

Pittston, Pa.—(Special.)—Harry Myers, cy. engr., says 3,150 square yards of asphalt paving on concrete will be constructed very soon on Broad-st.

Nashua, N. H.—(Special.)—A. W. Dean, cy. engr., says that stone block paving is contemplated, but has not been decided upon.

Minneapolis, Minn.—(Special.)—Brick paving on 6-in. concrete is contemplated for three streets, and stone block on sand for three streets.

Cincinnati, O.—A resolution has been passed to pave Hoge-st., from Goodwin-st. to Crescent-ave., with brick. Edwin Henderson, cy. clk.

Rochester, N. Y.—A petition has been circulated asking for Medina block paving on University-ave., from Culver park to the railroad crossing.

Mayfield, Ky.—The construction of from one to three miles of brick or stone sidewalks is contemplated this year. J. N. Cruchfield, cy. engr.

Winchester, Va.—An ordinance appropriating $1,600 for paving E. Water-st., between Main and Market, with vitrified brick was passed April 4.

Battle Creek, Mich.—(Special)—E. U. Hunt, cy. engr., says that 15,000 sq. yds. of brick paving will be constructed on Main and Washington-sts.

Terre Haute, Ind.—(Special)—Ralph A. Sparks, cy. engr., says that 800 square yards of brick paving on concrete will be laid on Sycamore-st. in May.

Kalamazoo, Mich.—(Special)—G. B. Pike, cy. engr., says considerable brick paving and sewer work is contemplated. The work will be done by day labor.

Columbia, S. C.—(Special.)—Chas. C. Wilson, cy. engr., says 12,000 sq. yds. of macadam paving and 5,000 sq. yds. of cement sidewalks will be constructed.

Columbia, Pa.—(Special.)—E. W. Goerke, cy. engr., says macadam and sidewalk paving will be constructed during the year, but nothing definite has been decided upon.

Manistee, Mich.—(Special.)—E. W. Muenscher, cy. engr., says that River and Arthur-sts., 7,515 sq. yds., will be paved with macadam on sand foundation during the summer.

Utica, N. Y.—Plans have been completed for paving Clinton-place, State and Henry-sts. Resolutions have been adopted for paving Broad, Canal, Potter and Water-sts.

Buffalo, N. Y.—The South Buffalo Business Men's Association has adopted a resolution favoring the establishment of a municipal asphalt plant.

Baton Rouge, La.—(Special)—R. Swart, cy. surv., says the question of issuing $200,000 bonds for paving, building sewers, etc., will be voted on in May.

Cranston, R. I.—An appropriation of $10,000

for general highway improvements and $5,500 for a steam road roller, was voted at the annual financial town meeting.

Galesburg, Ill.—(Special.)—M. J. Blanding, cy. engr., says that 3,750 square yards of brick paving on sand foundation will be constructed on Chamber-st. in June.

Boonville, Ind.—The question of macadamizing twenty-eight miles of roads will be voted on. C. Pelzer, Benjamin Carter, Wm. Carter A. L. Beeler and others, committee.

Columbus, Ga.—(Special.)—R. L. Johnson, supt. pub. wks., says 11,500 square yards of telford paving, at a cost of $8,000, is the only work contemplated this season.

Stillwater, Minn.—Main, Myrtle and Chestnut-sts. are in need of paving and Myron Shepard, city engineer, advises the use of brick instead of cedar blocks.

Denver, Col.—The paving of Twenty-third-ave., from Homer boulevard to the Fourteenth-st. viaduct, about fifteen blocks, with telford macadam, is practically assured.

La Crosse, Wis.—(Special.)—Frank Powell, cy. engr., says that 6,000 sq. yds. of brick paving on concrete foundation will be constructed on Main and Pearl-sts. in June.

Warren, O.—An ordinance was passed April 12 for paving High-st., from Park-ave. to Chestnut-st. with asphalt block or brick on crushed stone or concrete foundation.

Bethlehem, Pa.—The county grand jury recommended April 14 the improvement of the road between this place and Nazareth, a distance of 7½ miles; estimated cost, $37,500.

Harrisburg, Pa.—The question of purchasing a portable asphalt plant or awarding a contract for the repair of Market-st., is under consideration. M. B. Conden, cy. engr.

Peoria, Ill.—(Special.)—A. D. Thompson, cy. engr., says that 14,000 square yards of asphalt on concrete and 36,000 square yards of brick on concrete will be laid.

Binghamton, N. Y.—(Special.)—H. Ward says that specifications have been adopted for brick and asphalt paving on Washington-st., Vestal-ave. and Carroll and Collier-sts.

Rochester, N. Y.—The council contemplates paving as follows: Stone-st., asphalt, brick or Medina block; Elm-st., curb and gutter; Reynolds-st., macadam; Child-st., asphalt.

Cincinnati, O.—Bids will be asked soon for paving Spring Grove-ave., from Draper to Hopper-st. with asphalt. A resolution has been passed to pave Fairview-ave. with asphalt.

Middletown, O.—The property-owners on Wardlow-st., from Vandeveer-st. to Yankee road, are urging the matter of constructing curbing, guttering and cement sidewalks on that street.

Port Huron, Mich.—(Special.)—F. F. Rogers, cy. engr., says that 8,000 square yards of macadam paving will be laid on Gratiot-ave. and probably two miles of cement sidewalks constructed.

Jamestown, N. Y.—(Special.)—G. W. Jones, cy. engr., says that Chandler, Windsor and Allen-sts. and Fairmount-ave., aggregating 20,000 square yards, will be paved with brick on concrete.

East Orange, N. J.—The East Orange township committee decided April 13 to have an ordinance prepared for laying a stone sidewalk on Bedford-st., from Elmwood-ave. to Tremont-ave.

Ypsilanti, Mich.—A resolution has been passed to pave three blocks of Congress-st. with brick. The brow of the hill west of Congress-st. bridge will be paved with cedar block.

Dayton, O.—(Special.)—F. M. Turner, cy. engr., says that 16,000 square yards of asphalt paving on concrete foundation will be laid on Sycamore, Council, Pear, and other streets.

Baltimore, Md.—An ordinance was passed April 17 for sheet asphalt paving with vitrified brick gutters and strips between railway tracks on Fulton-st., from the park entrance to Pennsylvania-ave.

Logansport, Ind.—(Special.)—Walter A. Osmer, cy. engr., says that 4,000 square yards of asphalt paving on concrete on Market-st. and probably four blocks of brick paving will be laid in July and August.

Bloomington, Ind. — (Special.) — George Champe, cy. engr., says 5,000 square yards of macadam paving will be constructed on W. Sixth and N. College-ave. Also, 7,500 lin. ft. of brick sidewalk will be laid.

Duluth, Minn.—(Special.)—F. F. McGilvray, cy. engr., says that paving is contemplated as follows: Brick on concrete, Superior-st., 17,964 square yards; macadam, Fifth-st.; wood or stone block on sand, Fifth-ave., S.

Carbondale, Pa.—The property-owners on Washington-st. are willing to sign a petition for paving that street, provided the work can be done without delay. A large number are in favor of asphalt.

Elkhart, Ind.—(Special.)—D. F. Cordrey, cy. engr., says that 23,000 square yards of 1½-in. asphalt on 6-in. concrete will be laid on Second and Pigeon-sts. and 3,700 square yards of brick on E. Franklin-st.

Kingston, Tenn.—A contract will be let for five miles of pike road from Harriman to Clack's Gap. A resolution has also been passed by the county court to submit to vote the question of issuing $200,000 bonds for pike roads.

Auburn, N. Y.—(Special.)—D. F. Austin, cy. surv., says that 18,000 square yards of sheet asphalt paving on concrete foundation is contemplated on South-st. This work is not certain, but depends upon legislation and a vote.

Muskegon, Mich.—(Special.—C. S. Gamble, cy. engr., says that brick paving is contemplated. Owing to the fact that the municipal year does not begin until May 1, nothing definite is known of the proposed improvements.

Middletown, N. Y.—(Special.)—Van Alen Harris, cy. engr., says that 1,800 square yards of brick paving on concrete foundation will be laid on W. Main-st. this year. The work to be done this year has not been fully decided upon.

Montgomery, Ala.—(Special.)—J. W. Persons, cy. engr., says 14,000 square yards of brick paving will be constructed soon on Church, Bainbridge, Hill and Decatur-sts., and perhaps three miles of cement sidewalks let in small contracts.

Columbia City, Ind.—The city council decided April 18 to have plans and specifications prepared for paving Jefferson-st., from Chancery to Main, and the streets surrounding the public square. Mayor Menaugh.

Hamilton, O.—(Special.)—L. A. Dillon, cy. engr., says bids will be received on asphalt, brick and asphalt block paving on concrete on the following streets: Second-st., 16,700 square yards; N. Third-st., 22,300 square yards; S. Third-st., 9,700 square yards.

East St. Louis, Ill.—(Special.)—L. L. Harper, cy. engr., says contracts will be let soon for 60,000 square yards of wood or stone block paving on Missouri-ave. About 100,000 square yards of brick paving on concrete is under contract.

Albany, N. Y.—(Special.)—Horace Andrews, cy. engr., says that 45,000 square yards of brick paving on 6-in. concrete will be constructed this season in Elizabeth, Hamilton, Dove, Morton and Lexington-sts., and 1,360 square yards of stone block paving on Howard-st.

Augusta, Me.—(Special.)—W. B. Getchell, cy. engr., says that paving is contemplated as follows: Macadam on gravel foundation, Water-st., 1,800 square yards, and Willow-st., 2,200 square yards; stone, Cony-st., 1,000 square yards; concrete sidewalks, 2,500 feet.

Newark, N. J.—Ordinances have been passed for asphalt paving on S. Ninth, N. Thirteenth, S. Forty-first, and Marshall-sts., Coe Place, Mt. Prospect-ave. between Arlington and Elwood-aves., will be paved with asphalt, with brick between the car tracks.

Nebraska City, Neb.—(Special.)—A. M. Munn, cy. engr., says that the wood block pavement laid in 1888 on Central-ave., between Second and Sixth-sts., will be replaced with brick or concrete in June and July. The work embraces 8,000 square yards and will cost $7,500.

Altoona, Pa.—(Special.)—Harvey Linton, cy. engr., says that 2,000 ft. of brick paving on 6-in. concrete on Sixteenth-st., from Eleventh to Thirteenth, is contemplated. Macadamizing, asphalt repairs and 5,000 ft. of brick sidewalks are also contemplated.

East Liverpool, O.—(Special.)—John A. George, cy. engr., says that brick paving on gravel foundation will be constructed this summer as follows: Lisbon-st., 3,000 square yards; Pennsylvania-ave., 3,500 square yards. Grading—Avondale-st., 7,000 cubic yards; Trentvale-st., 6,000 cubic yards.

Moline, Ill.—The recent law passed by the legislature, providing that paving shall be conditional upon the petition of the majority of abutting property-owners in each half mile instead of in each block, may result in giving the city some additional paving this summer.

St. Paul, Minn.—City Clerk Bronson has been instructed to advertise for bids for paving Wacouta-st., from the Union depot grounds to Fifth with granite, and from Fifth to Ninth with brick. The question of paving Nelson-ave., from Summit to Western-ave., with asphalt is being considered.

Newport, Ky.—(Special.)—W. L. Glazier, cy. engr., says that 20,000 lineal feet of combined concrete curb and gutter and 1,800 square yards of new and reconstructed macadam paving and 2,000 lineal feet of cement sidewalks will be constructed.

Toledo, O.—(Special.)—W. F. Brown, Cy. C. E., says that paving will be constructed during 1899 as follows: Asphalt on c.n. concrete, six streets, 20,493 square yards; cost, $38,781. Brick on 6-in. concrete, 24 streets and one alley, 103,375 square yards, $192,266. Macadam, Bancroft-st., 6,166 square yards, $7,200.

Erie, Pa.—(Special.)—B. E. Briggs, cy. engr., says that Walnut-st., from Eighth to Twelfth, 4,400 square yards, will be paved with asphalt on 6-in. concrete and Holland, from Eighth to L., S. & M. S. R. R., 8,400 square yards, will be paved with brick in June or July. The contracts have not been let.

Amsterdam, N. Y.—Special.)—F. E. Crane, cy. engr., says that 12,000 square yards of asphalt or brick paving on concrete foundation will be constructed on Division-st., during the season, at an estimated cost of $24,000. Also, about three or four miles of residence streets and roads to the city limits will b paved with macadam by the city.

Chicago, Ill.—The board of local improvements has ordered brick paving for Ardenave., from State-st. to Ashland-ave. The propositions to pave State-st. and Wabasn-ave. with granite were laid over until May 3, when they will be given a public hearing. The south park board received a petition April 12 asking that Michigan-ave., between Eighteenth and Thirty-fifth-sts. be repaved with asphalt, which was granted.

Indianapolis, Ind.—The board of public works has been advised that the Strong law adds much to the method of procedure in making public improvements, but does not alter the old method, and that if it takes all the steps required by the law its action will be safe and valid. Acting on this advice the board will go ahead with improvements and has already taken steps to advance about sixty resolutions which were delayed by the litigation over the Strong law. Bids have been received for many of these improvements.

CONTRACTS TO BE LET.

Lafayette, Ind.—Bids are asked until May 8 for improving two streets. Jas. K. Risk, cy. clk.

Springfield, O.—Bids are asked until May 1 for improving certain streets. Philip Huonker, cy. clk.

Mansfield, O.—Bids are asked until May 6 for improving Bartley and Baldwin-aves. F. M. Remy, cy. clk.

Crawfordsville, Ind.—Bids will be received until May 8 for cement sidewalks. F. Hoffman, cy. clk.

Ithaca, N. Y.—Bids are asked until May 2 for about 18,000 square yards of stone and brick paving.

Bradford, Pa.—Bids are asked until May 1 for paving Elm-st. with vitrified brick. Jos. A. Lindsey, cy. clk.

Martinsville, Ind.—Bids are asked until May 19 for improving Pike-st., between Home and Park-aves. C. G. H. Goss, C. E.

South Bend, Ind.—Bids will be received until May 8 for improving certain streets and sidewalks. L. A. Hull, cy. clk.

Benwood, W. Va.—Bids are asked until May 1 for brick paving, according to press reports. M. Dolan, chrmn. com.

Steubenville, O.—Bids are asked until May 9 for grading and improving about 3,500 lin. ft. of road. Sam Huston, engr.

Middletown, Ind.—Bids are asked until May 1 for cement sidewalks in certain streets. W. L. McCampbell, clk. bd. trustees.

Galena, Minn.—Bids will be received until May 6 for grading Cedar Run, between

sections 32 and 33. P. Magnusen, chrmn suprs.

Williamsport, Pa.—Bids are asked until May 1 for 2,305 sq. yds. of brick paving on concrete foundation. Theo. Cornman, cy. clk.

Newport, Ind.—Bids will be received until May 3 for building 13 miles of gravel roads in Vermillion county. Wm. P. Dell, co. audt.

Marion, Ind.—Bids will be received until May 2 for paving the sidewalks of White's-ave., from Second to Seventh. C. G. Robbins, cy. clk.

Hackensack, N. J.—Bids are asked until May 4 for grading and macadamizing several streets and roads in Franklin twp. Daniel Depew, twp. clk.

Kokomo, Ind.—Bids will be received until May 8 for 2,200 square yards of brick paving and 1,100 ft. of curbing and cement sidewalks. Chas. R. Ford, cy. clk.

West Shoals, Ind.—Bids will be received until May 6 for constructing four macadamized roads in Center township, aggregating 45,174 ft. Horatio Harryman, co. audt.

Houston, Tex.—Bids will be received until May 8 for paving with macadam, gravel, brick and asphalt several streets and avenues. I. Austin Miller, cy. engr.

Wabash, Ind.—Bids will be received until May 8 for paving the sidewalks of Ross-ave., between Manchester-ave. and Wabash-st., with cement. Fremont McLees, cy clk.

Crown Point, Ind.—Bids will be received until May 10 for constructing a series of free gravel roads in Ross twp., aggregating about twenty-two miles. Michael Grimmer, co. audt.

Cincinnati, O.—Sealed proposals will be received until May 3 for keeping in repair for five years streets which have been paved with asphalt. A. B. Ratterman, prest. B. C. A.

Terre Haute, Ind.—Bids will be received until May 2 for grading, curbing and paving the sidewalk on Fourth-st., from Ohio to Osborne. Wm. Hamilton, cy. clk.

Washington, D. C.—Bids are asked until May 20 for laying asphalt block pavements and for paving several streets with sheet asphalt. John B. Wight, chrmn. Dist. comrs.

Ft. Wayne, Ind.—Bids will be received until May 4 for paving five streets with asphalt, asphalt block or vitrified shale blocks on concrete foundations. H. B. Manning, cy. clk.

Glens Falls, N. Y.—Sealed proposals will be received until May 15 for constructing about 18,000 square yards of vitrified brick paving on concrete foundation in Glen, Warren, South and Bay-sts. W. M. Cameron, vil. clk.

Indianapolis, Ind.—Sealed proposals will be received until May 3 for paving Market-place, between Market and Wabash-sts., and between Alabama and the Market house, with brick on 4-in. hydraulic cement gravel concrete, curbing with artificial stone, and paving stall places with cement. M. A. Downing, prest. B. P. W.

Baltimore, Md.—Sealed proposals will be received until May 10 for paving Pine-st., from Lexington to Saratoga, with sheet asphalt; to repair streets and bridges paved with sheet asphalt; to pave Bush-st., from Columbia-ave. to the mouth of the Bush-st. sewers with cobblestone; to pave Lovegrove alley, from Twenty-seventh to Twenty-eighth-st. with cobblestone. Wm. W. Varney, cy. com'r.

CONTRACTS AWARDED

New Orleans, La.—The contract for paving Burgundy-st. with asphalt was awarded to the Barber Asphalt Paving company.

Huntington, Ind.—The contract for street paving was awarded to Kinney & Swinehart of Elkhart for about $40,000.

Wabash, Ind.—The contract for asphalt paving has been awarded to the Barber Asphalt Paving company at $1.95 a square yard.

Irvington, Ind.—John Moore secured the contract for one mile of 5-ft. cement sidewalk on Lowell-ave. at 56 cts. a lin. ft.

Marinette, Wis.—The contract for paving Riverside-ave. with brick was awarded April 7 to John Martin of Oshkosh, Wis., for $4,356.60.

Benton Harbor, Mich.—The Barber Asphalt Paving company was awarded the contract April 17 for paving Pipestone-st. with asphalt at $1.73 a square yard.

Monon, Ind.—The contract for building cement sidewalks has been awarded to the Indiana Construction company of Terre Haute, Ind., for $17,000.

Elwood, Ind.—The contract for vitrified brick paving was awarded April 3 to W. W. Hatch & Sons of Goshen, Ind., for $29,888.

Newark, N. J.—John F. Shanley was awarded the contract April 6 for paving Warren-st., from Newark to Bruce, with granite blocks at $2.26 a square yard.

Gloversville, N. Y.—On account of a legal error the bids received March 28 for brick paving have been rejected. The contract was let to Erbeck Bros.

New Brunswick, N. J.—A contract has been awarded to R. A. Montgomery of Lambertville, N. J., for macadamizing the road from Cranbury to Cranbury Station for $7,650.

Waukesha, Wis.—August Dienan was awarded the contract April 14 for paving Broadway, Clinton and South-sts. for about $22,831. Purington brick will be used.

Kokomo, Ind.—Contracts for brick paving have been awarded as follows: Walnut-st., McGlynn & Grace, $1,752.15; Mulberry-st., Yeager & Dickerson, Danville, Ill., $1,763.

Reading, Pa.—Bids were received March 30 for paving N. Sixth-st., from Penn. to Washington as follows: Pennsylvania Asphalt company, $2.18 a square yard; Ricardson & Ross, $2.33 a square yard.

Norfolk, Va.—The contract for paving St. Mary's-ave. with vitrified brick and granite curbing was awarded April 14 to Sands & Lawson and for granolithic sidewalks to S. L. Foster & Son.

Buffalo, N. Y.—The committee on streets reported in favor of awarding the contract for resurfacing and repairing the asphalt paved streets of this city for 1899 to the Barber Asphalt Paving company.

Nebraska City, Neb.—The contract for furnishing 500,000 paving brick has been awarded to Harry Wales at $10 per thousand and the contract for sand to I. Sneed, at 95 cts. a cubic yard delivered on street.

Jamestown, N. Y.—Bids were received April 15 for 11,580 square yards of brick paving, 5,700 lin. ft. of curbing and 210 ft. of curved curbing as follows: Jamestown Con-

struction company, $20,738.75; Gust Burlond, $20,246.65.

Saginaw, Mich.—The Barber Asphalt Paving company was awarded contracts April 17 for paving Court and Hamilton-sts. with asphalt at $1.52 a square yard; totals, Court-st., $44,442.80; Hamilton-st., $8,942.85.

Boston, Mass.—Contracts for surfacing sections 1 and 2 of Boyleston-st. were awarded April 4 as follows: Section 1, Newell & Snowling Construction company, Uxbridge, Mass., $11,599; section 2, Asa Goddard, Worcester, Mass., $11,049.

Akron, O.—Paving contracts were awarded April 15 as follows: Crosley-st., 5,092 square yards; Herring & Son, Mansfield, O., Akron brick, 53¾ cts.; total, $4,724.18. Maple-st., 11,377 square yards, brick, Jas. Wildes & Son, Akron, 59 cts.; total, $12,230.16.

Memphis, Tenn.—Contracts for supplies have been awarded as follows: Paving brick, Tennessee Paving company, Robbins paver, $14 per 1,000; granite blocks, Brantly Granite company; curbing, E. O. Reagan & Co.; sand, Kavanaugh company; sewer pipe, Wright Lime and Cement company.

Davenport, Ia.—The contract for paving 15 streets with brick was awarded to Daniel A. McGugin April 6 at prices ranging from $1.21 to $1.40 for paving; curbing, 30 to 56 cts. a lin. ft.; resetting curbing, 8, 9, 10 and 19 cts.; tile, 6, 8 and 10 cts. The bids were received April 1.

Anderson, Ind.—Bids were received April 20 for 22,500 square yards of brick paving, 60,000 ft. of cement sidewalks and 17,000 ft. of stone curbing. The entire contract was awarded to Chas. H. Daniels of this city at $1.21 for paving; 65 cts. for curbing and 13½ cts. for sidewalks.

Hartford, Conn.—The Southern New England Paving company was awarded contracts for paving six streets with sheet asphalt at the following prices: Market-st., from Temple to Morgan and Allyn and High-sts., $2.56 a square yard; Gold-st., $2.55; Farmington and Windsor-ave., $2.59.

Chicago, Ill.—Bids were received April 19 for street paving. The engineer's estimate for granite paving was $3.25, while the bids ran from $3.67 to $3.92 a square yard. The engineer's estimate for asphalt paving was $2.10 a square yard, but one company's bid was $1.90. The contracts have not been awarded.

Bedford, Ind.—The contract for paving Thirteenth and Fourteenth-sts. have been awarded to J. E. Voorhees & Co. of Terre Haute at $2.48 and $2.80, respectively. Terre Haute brick will be used. The contract for constructing 9 miles of gravel or macadam roads was awarded to W. R. Clarke of this city for $15,164.

Joliet, Ill.—The contract for macadamizing Wilcox-st., from Western-ave. to Douglas-st., 9,400 square yards, was awarded April 16 to John Fleming as follows: Macadam, 48 cts.; curbing, 35 cts.; excavating, 17 cts.; manhole covers, 50 cts. each; catch-basin, 50 cts. each; new catchbasins, $18 each.

Paterson, N. J.—Bids were received April 3 for 16,200 square yards of asphalt as follows: Barber Asphalt Paving company, New York City, $2.24 a square yard; Atlantic Alcatraz Asphalt company, Newark, $2.27; Geo. McDonald, Paterson, $2.07; New Jersey Asphalt company, Newark, $2.14; Paterson Construction company, Paterson, $2.15; Marley & Forbes, Paterson, $2.15.

Philadelphia, Pa.—Bids were received April 12 for improving McPherson square, including walks, grading, sowing seed, sodding, planting trees, etc., from the following: Vulcanite Paving company, Atlas Paving company, J. H. Hinkle Co., Guarantee Paving company, W. H. Quinn, American Artificial Stone Paving & Construction company and J. L. Clymer & Co. The bids were ordered scheduled.

St. Louis, Mo.—The lowest bids received for street paving April 19 were as follows: Page, brick, Mound City Construction company, $17,692; Natural Bridge novaculite, M. A. Hogan, $2,805.55; Jefferson, granite, Heman Construction company, $5,458.65; Newstead, brick, Gilsonite Roofing and Paving company, $5,029.40; Whittier, brick, Gilsonite Roofing and Paving company, $10,972.40.

Salem, O.—Bids were received April 14 for 15,300 square yards of asphalt block paving in Ellsworth-st. The bids for paving only were as follows: J. C. Carland, $1.38 a square yard; A. G. Pugh, $1.40; Alfred & W. H. Adams, $1.40; W. R. Johnson, $1.38; Davis & Caldwell, $1.38; John Hadley, $1.39; G. P. Herring & Son, $1.43. Bids were received at the same time for paving E. High-st. with asphalt blocks and a number of streets with brick.

Lafayette, Ind.—Paving contracts have been awarded as follows: Barber Asphalt Paving company, New York City, three streets, grading, 30 cts. a cubic yard; gravel sub-base, 70 cts. a cubic yard; drain tiling, 6 cts. a ft.; stone curbing, 75 cts. a ft.; circle curbing $3.50 per piece; asphalt paving, $1.60 a square yard; marginal stones, 45 cts. a ft.; cement walks, 13 cts. a sq. ft.; sodding, 1 ct. a sq. ft. Wm. F. Frey, city, one street, gravel sub-base 55 cts.; drain tiling, 5 cts.; stone curbing, 73 cts.; circle curbing, $5.94 per piece; grading, 25 cts.; asphalt block paving, $1.95; marginal stones, 50 cts.; cement walks, 12 cts.; sodding, 1 ct.

San Antonio, Tex.—Bids were received April 8 for paving with asphalt W. Converse-st. as follows: Municipal Improvement company, excavation and 6-ins. of concrete with 2½ ins. of natural rock asphalt, $2.35 a square yard; limestone curbing, 45 cts. a lin. ft.; sandstone curbing, 52 cts.; cement curbing, 44½ cts. Trinidad Asphalt Improvement company, excavation, 28 cts. a cu. yd.; asphalt, $2.43 a square yard; limestone curbing, 42 cts.; sandstone curbing, 55 cts. The Municipal Improvement company also offered a bid of $2.15 a square yard for asphalt, concrete and excavation if 4 ins. instead of 6 ins. of concrete is used.

Scranton, Pa.—The contract for paving E. Market-st. with brick on concrete was awarded April 10 to Mears & Flynn at $1.78 a square yard for paving, 63 cts. for straight curb and 94 cts for circular curb. Bids were received April 13 for vitrified brick paving on concrete base on N. Main-ave. and Providence road and Sanderson-ave. Three bids were received for the N. Main-ave. and Providence road and called for a 10-yr. guarantee and were as follows: M. H. Dale, $1.98; Girard Construction company, Philadelphia, $1.97; Geo. McDonald, $1.79. The bids for Sanderson-ave. called for a 5-yrs. guarantee and were: Mears & Flynn, $1.75;

M. H. Dale, $1.77. The contracts have not been awarded.

Michigan City, Ind.—(Special.)—The bids on asphalt paving, opened on April 24th, were as follows: Franklin-st., 22,000 square yards, five years guaranty, 6-in. concrete foundation, Central Bermudez company, $1.92 a square yard; Warren-Scharf Asphalt company, $1.83; Assyrian Asphalt company, $1.65; R. F. Conway company, $1.55. Pine-st., 10,800 square yards, five years guaranty, 4-in. concrete foundation, Central Bermudez company, $1.80; Warren-Scharf Asphalt company, $1.85; Assyrian Asphalt Co., $1.69; R. F. Conway company, $1.45. Spring-st., 10,400 square yards, five years' guaranty, 4-in. concrete foundation, Central Bermudez, company, $1.79; Warren-Scharf Asphalt company, $1.85; Assyrian Asphalt company, $1.68; R. F. Conway company, $1.45. Wabash-st., [illegible] square yards, five years' guaranty, 4-in. concrete foundation, Central Bermudez company, $1.75; Warren-Scharf Asphalt company, $1.79; Assyrian Asphalt company, $1.69; R. F. Conway company, $1.49. The contract on Pine, Spring and Wabash-sts. will probably be awarded to the Central Bermudez company. There is some talk of paving Franklin-st. with brick.

SEWERS.

Chicago, Ill.—An investigation of the Forty-fifth-ave. sewer has resulted in numerous defects being found in it. Several hundred feet of the arch will have to be rebuilt at an estimated cost of $3,000.

Scranton, Pa.—Dunn Bros., to whom was awarded the contract for constructing the seventeenth district main sewer, have declined to begin work until the city has made the necessary appropriation. Dunn Bros.' claim that no appropriation has been legally made is based on the fact that the estimate committee failed to provide in the annual appropriation ordinance for the city's share of the cost of the new sewer, which, under a recent law, is fixed at two-thirds of the entire clause. The ordinance contains a clause reading that such appropriation "shall be and hereby is made," but the money itself is not actually in sight. The question has never before come up in this city.

CONTEMPLATED WORK.

Brookline, Mass.—The citizens have voted $30,000 for new sewers.

Fargo, N. D.—The construction of about one mile of 36-in. brick sewer is contemplated.

Kenosha, Wis.—The council has voted to construct sewers and catch basins in a number of streets.

Tucson, Ariz.—The building of sewers is urged by Judge Wright at a cost of $50,000.

Sioux City, Ia.—Plans have been ordered prepared for a storm water sewer on Pierce-st.

Madison, N. J.—The question of building sewers is being considered by the board of health.

Voted to issue bonds: Fayetteville, N. C.; Wallace, Idaho; Brookfield, Mo.; Turtle Creek, Pa.

West Palm Beach, Fla.—Plans and estimates for a new sewerage system have been prepared by O. W. Weybrecht.

Lawrence, Kas.—An ordinance has been passed to construct a sewer in an alley. A. G. Honnold, cy. clk.

Lebanon, Pa.—The question of securing an engineer to prepare plans for sewerage is being considered.

Clarinda, Ia.—The construction of a sewer on the east side of the public square is contemplated.

Winchester, Va.—An ordinance has been introduced appropriating $15,000 for a sewerage system.

Meriden, Conn.—(Special.)—W. S. Clark, cy. engr., says that about 14,000 ft. of 8 to 12-in. pipe sewers will be constructed.

Port Huron, Mich.—(Special.)—F. F. Rogers, cy. engr., says that 2,500 ft. of 15, 12, 10, 8-in. pipe sewers are contemplated.

Elkhart, Ind.—(Special.)—D. F. Cordrey, cy. engr., says that 11,000 ft. of 12 to 30-in. pipe sewers are contemplated.

Hyde Park, Mass.—(Special.)—A. D. Nickerson, cy. engr., says that 1¼ miles of 8 and 10-in. sewers will be constructed.

Ft. Wayne, Ind.—(Special.)—H. B. Manning, cy. clk., says five miles of 3, 4, 6 ft. brick sewers will be constructed.

Clinton, Ia.—(Special.)—Chas. P. Chase, cy. engr., says that 2,000 ft. of 18, 12, 8-in. pipe sewers will be constructed.

Richmond, Cal.—The building of sewers is being urged by the Richmond District Improvement Association.

Pittsburg, Pa.—The construction of pipe sewers in a number of streets is contemplated. H. J. Ford, mayor.

McKees Rocks, Pa.—The question of issuing $100,000 bonds for sewer and street improvements is being considered.

Big Rapids, Mich.—Plans for 74 ft. of 10-in. pipe sewer in Mill-st. have been prepared by L. W. June, cy. engr.

East Liverpool, O.—(Special.)—John A. George, cy. engr., says that six miles of 4 to 12-in. pipe sewer will be constructed.

Hazleton, Pa.—(Special.)—A. B. Celiax, cy. engr., says that 3,000 lin. ft. of 15-in. pipe sewers will be constructed.

Augusta, Me.—(Special.)—W. B. Getchell, cy. engr., says that 2,000 lin. ft. of pipe sewers will be constructed.

Asheville, N. C.—(Special.)—B. M. Lee, cy. engr., says a few 6-in. branch lines of sewers will probably be constructed.

Auburn, N. Y.—(Special.)—D. F. Austin, cy. surv., says that 7,500 lin. ft. of 15 to 8-in. pipe sewers will be constructed.

Cedar Rapids, Ia.—(Special.)—G. H. Merridith, cy. engr., says that the construction of storm water sewers is contemplated.

Omaha, Neb.—Bids will be asked for the construction of the North Omaha sewer; estimated cost, $33,000. Andrew Rosewater, cy. engr.

Chattanooga, Tenn.—Robt. Hooke, cy. engr., will prepare an estimate of the cost of completing the Washington-st. sewer. Mayor Watkins.

Oregon City, Ore.—The construction of a sewerage system in the residence part of the city is contemplated. C. D. Latourette, mayor.

San Francisco, Cal.—Resolutions have been passed to build pipe and brick sewers in a number of streets. M. F. Fragley, supt. of sts.

Northampton, Mass.—The construction of a 4-ft. brick sewer, to relieve Pleasant-st. brook of the sewage drained into it, is contemplated.

Youngstown, O.—The council voted April 10 to build storm water sewers in districts Nos. 3 and 4. F. C. Brown, cy. clk.

Springfield, Ill.—Main sewers and house connections will be built in Woodlawn and Ferncliffe-aves. Philip Huonker, cy. engr.

Jacksonville, Ill.—(Special.)—About 7,500 lin. ft. of 12-in. pipe sewers will be constructed. The contract has not been awarded.

Troy, N. Y.—(Special.)—M. Schenck, cy. engr., says that 1,000 lin. ft. of 12-in. pipe sewers will be constructed at a cost of $1,250.

Elmira, N. Y.—The city engineer has prepared plans for a sewer in College-ave., from Second-st. to Roe-ave.; estimated cost, $2,500.

Owosso, Mich.—(Special.)—The sum of $15,000 has been voted for main sewers. The plans were prepared by Riggs & Sherman of Toledo, O.

Quincy, Ill.—The city council has adopted an ordinance for building a storm sewer in the north end of the city; estimated cost, $8,400.

Baton Rouge, La.—(Special.)—R. Swart, cy. surv., says the question of issuing bonds for building sewers will be voted on in May.

Jamaica, L. I.—The borough of Queens contemplates the construction of a more comprehensive and permanent sewerage system.

Minneapolis, Minn.—(Special.)—About 17,930 lin. ft. of 24-in. brick and 12 to 18-in. pipe sewer will be built in 18 different streets.

Pittston, Pa.—(Special.)—Harry Myers, cy. engr., says that 6,890 ft. 15-in. brick and 4,440 ft. 8-in. pipe sewers will be constructed.

Norristown, Pa.—(Special.)—S. C. Corson, boro engr., says that 1,800 lin. ft. 8-in. and 1,900 lin. ft. 30-in. pipe sewers is contemplated.

Newport, Ky.—(Special.)—W. L. Glazier, cy. engr., says that sewers to cost about $20,000 are projected, but nothing has been determined on.

Dayton, O.—(Special.)—F. M. Turner, cy. engr., says that 58,150 ft. of 8 to 12-in. pipe sewers will be constructed in sanitary districts 9 and 4.

Marshall, Mich.—(Special.)—This town has voted $25,000 for the construction of main sewers, after plans prepared by Riggs & Sherman, of Toledo, O.

Petoskey, Mich.—A resolution has been passed to construct a sewer on State-st., from Howard-st. to Kalamazoo-st. James E. Niles, cy. clk.

Galesburg, Ill.—(Special.)—M. J. Blanding, cy. engr., says that 800 ft. of 36-in. brick and 18-15-12-in pipe sewers will be constructed in May.

Erie, Pa.—(Special.)—B. E. Briggs, cy. engr., says that 3,260 ft. of 12 and 15-in. pipe sewer will be constructed. The contract has not been let.

East St. Louis, Ill.—(Special.)—L. L. Harper, cy. engr., says that the contract for a brick outlet sewer will be laid this year. Estimated cost, $750,000.

Bay City, Mich—(Special.)—Geo. Turner, cy. engr., says that 9,000 ft. of brick and 10,000 ft. of pipe sewers, and possibly more, will be constructed.

Seattle, Wash.—A resolution has been introduced directing the city engineer to make estimates for connecting sewers with the south sewer tunnel.

Gettysburg, Pa.—A franchise has been granted to a company to build and operate a sewerage system. Dr. J. W. C. O'Neal and John M. Warren interested.

Lexington, Ky.—The question of building a branch sewer to the Davis bottom sewer, and a sewer in the North Side, is being considered. P. P. O'Neil, cy. engr.

Butte, Mont.—(Special.)—F. C. Bickenbach, cy. engr., says that 500 ft. of 4x6-ft. brick and stone sewer, and 7,000 ft. of 10-in. pipe sewer will be constructed.

Toledo, O.—Special.)—W. F. Brown, C. E., says that 10,707 ft. of 24 to 72-in. brick sewer, and 19,866 ft. of 8 to 24-in. pipe sewer will be constructed during 1899.

Topeka, Kas.—(Special.)—Wm. H. Barnes, cy. engr., says that a sewerage system, comprising 4,200 ft. of brick sewer and 40,000 ft. of pipe sewers, is contemplated.

Waukesha, Wis.—The construction of sewers has been recommended in Barstow, Huron, Charles, Center and Main-sts., and Prospect-court, Broadway, East, West and Oakland-aves.

Amsterdam, N. Y.—(Special.)—F. E. Crane, cy. engr., says that the usual annual extensions of 8 and 24-in. pipe sewers and about one-half mile of storm drains will be built.

Rochester, N. Y.—The city engineer will make a survey for a sewer to carry the sewage from the East Side tank sewer, now emptying into the river below Seneca park.

Battle Creek, Mich.—(Special.)—E. U. Hunt, cy. engr., says that some brick sewers may be constructed and that 24-21-15-12-in. pipe sewers will be constructed in Calhoun and Fremont-sts.

Newark, N. J.—A resolution was adopted April 21 to advertise for proposals to drain the meadows. The resolution provides for the Holland plan of reclamation by diking and pumping.

Altoona, Pa.—(Special.)—Harvey Linton, cy. engr., says that sewers are contemplated as follows: 6-2-9-ft. brick storm sewers; 9-163 ft. of 24-in. concrete tunnel intercepting sewer in Sixth alley.

Nebraska City, Neb.—(Special.)—A. M. Munn, cy. engr., says that the 2,200-ft. of 15-in. pipe will be constructed in extending the Seventh-st. storm sewer to the river. The proposed sewer is an interceptor and is designed to take sewage from the storm sewer and carry it to the river. The storm water flows into North Table creek.

Lorain, O.—Plans for three sewer districts have been ordered. L. A. Fauver, cy. engr.; Riggs & Sherman, Toledo, O., cons. engrs. The Johnson Steel company's Townsite department of this city is also having plans prepared for storm water sewers. F. M. Haynes, engr.; Riggs & Sherman, cons. engrs.

Westboro, Mass.—A report will be made to the state board of health about May 1 by Engineers Van Valkenbrug and Hyde, who have nearly completed their survey of the Westboro sewage beds. They will recommend 2,000 ft. of 15-in. iron pipe to replace the terra cotta pipe now in use at the foot of Summer-st., at a cost of about $9,000. The cost of remodeling the sewage disposal beds will be $11,000.

CONTRACTS TO BE LET.

Elyria, O.—Bids will be received until May 8 for constructing the West-st. sewers. W. H. Park, clk.

Olean, N. Y.—Bids are asked until May 2

for extending certain sewers. E. E. Allen, supt. of sts.

Bridgeport, Conn.—Bids will be received May 5 for brick sewers. Bernard Keating, clk. B. P. W.

Hammond, Ind.—Bids are asked un.. ay 2 for building 3,620 ft. of 4-ft. brick sewers. P. J. Lyons, cy. engr.

Medford, Ore.—Bids will be received until May 15 for building a sewerage system. H. L. Gilkey, mayor; J. W. Lawton, recorder.

Sauk Center, Minn.—Bids will be received until May 3 for building all or any part of a sewerage system. J. L. Cooper, cy. clk.

Mt. Vernon, N. Y.—Bids are asked until May 2 for building receiving basins and pipe connections in certain streets. Wm. N. Hoyt, clk.

South Bend, Ind.—Bids will be received until May 8 for 15-in. vitrified salt-glazes sewer and 10-in. sewer pipe. L. A. Hull, cy clk.

Lead, S. D.—Bids will be received until May 15 for building a main sewer, including a tunnel of about 600 ft. P. A. Gushurst, mayor.

Chicago, Ill.—Bids will be received until May 10 for a new sewer at the United States marine hospital in this city. Jas. Knox Taylor, supr. arch., Washington, D. C.

San Carlos, Ariz.—Bids will be received until May 8 for a sewerage system at San Carlos Agency. W. A. Jones, Com'r Indian Affairs, Washington, D. C.

Indianapolis, Ind.—Bids will be received until May 3 for constructing a main sewer, with all appurtenances and lateral connections, in Hillside-ave. M. A. Downing, chrm. B. P. W.

Auburn, Ind.—Sealed propcsals will be received until May 17 for constructing a combined sewer system for the urban and suburban districts, requiring the following: 56,000 ft. of 36-30-27-24-20-18-10-8-6-4-in. sewer; 75 brick manholes; 25 pipe lamp holes; 250 pipe catchbasins; 25 pipe flushing holes; 110 carloads clay pipe; 300 bbls. cement; 100 cu. yds. sewer castings; 10 tons cast-iron pipe. J. J. Van Auken, C. E.

CONTRACTS AWARDED.

Macon, Mo.—The contract for building the sewerage system has been awarded to Lynch & Anderson of Moberly, Mo., for $21,762.

Independence, Mo.—Nevins & Johnson of Kansas City submitted the lowest bid, $15,282.26, for constructing the sewerage system and will be awarded the contract.

Ottawa, Ont.—The contract for constructing section 2 of the main drainage system was awarded April 14 to O'Leary & Robillard of this city for $226,119.

Akron, O.—James Wildes & Son were awarded the contract for building 18,900 lin. ft. of brick sewers, including 425 ft. of tunnel through a hill, for $37,964.68.

St. Paul, Minn.—Anerson & Johnson secured the contract for building sewers on Cherokee-ave., from Belmont to Orleans, and Smith-ave., from Sidney to Cherokee-ave., for $13.683.

Kearney, N. J.—Contracts for lateral sewers have ben awarded as follows: First section, Edward Sargent, $2,977.16; second section, $1,948.10; third section, $3,444.60, and fourth section, $8,377.08, James Conway of Newark.

Providence, R. I.—Sewer contracts were awarded April 11 as follows: Angell-st. and Blackstone Park, Wm. H. Sherman; Hawthorn, French, Spencer, Olney and Waldo-sts., and Morris and Elmgrove-aves., and Exchange Place, Fred E. Shaw; Mulberry, State and Holden-sts., N. W. Colgrove.

Washington, D. C.—The contract for excavation and concrete work on the proposed middle service sewer for the District of Columbia, to be located near Brightwood, has been recommended for award to R. A. Malone of Lancaster, Pa., at 40 cts. a cu. yd. for excavating and $7.20 per yd. for concrete work.

Concord, Mass.—Bids were received April 10 for completing the sewerage system, as follows: T. W. Kinser & Sons, $29,279; Michael Russo & Co., $29,515; Samuel W. Frecoln, $34,028; Bruno & Salomone, $34,794; Lucian A. Taylor, $36,820; Frank L. Allen, $53,401; Chas. C. Craib, $54,027; C. E. Trumbull & Co., $58,172.

North Braddock, Pa.—The contract for building a brick main sewer outlet from North Braddock through Braddock borough, over East and Sixth-sts., was awarded April 18 to Sloan & McIlwaine, for $20,500; for a sewer in Hawkins-ave., John Dell & Co., $4,660; Corey, Center and Charles-sts., John Dell & Co., $4,374.

WATER-WORKS.

Lexington, Ky.—The water works committee of the city council has recommended that the mayor be empowered to appoint a commission to purchase the water works.

Valparaiso, Ind.—The Valparaiso Water Co. shut off the water, April 12, at every place where a meter is used which was not put in by the company. The company charges $17 for a meter, but a local plumber cut the price to $12. The city will test the matter in the courts.

Lancaster, Pa.—A report on the proposed improvement of the water supply system and the construction of a filtration plant, has been submitted by Allen Hazen, M. Am. Soc. C. E. He recommends a filtering plant, and says that sand filtration is best suited to the conditions of Lancaster's system, and would prove most satisfactory. The estimated cost of the improvements is $278,000.

Media, Pa.—The new pumping machinery and filtering plant was tested recently. The steam pump has a capacity of 1,176,000 gallons a day, and the filter is guaranteed to clear 500,0000 gallons of water a day. In testing a run of six and one-half hours was made, which rendered clear as crystal 432,400 gallons of creek water, which was before the test extremely muddy owing to heavy rains. The filter is eight feet in diameter, thirty feet long, weighs about thirty tons and holds thirty tons of sand. The plant cost less than $30,000.

CONTEMPLATED WORK.

Auburn, N. Y.—The water board has decided to lay 3½ miles of water mains during the summer.

Willimantic, Conn.—Plans have been made for a pumping plant.

Tucson, Ariz.—The issue of bonds for water works is urged by Judge Wright.

Essex Junction, Vt.—The committee will report soon on the proposed water supply.

Memphis, Tenn.—The erection of auxiliary water works is urged by Councilman Walsh.

Holyoke, Mass.—(Special.)—A new reservoir of 300,000,000 gallons' capacity will be built.

Jacksonville, Ill.—(Special.)—About 11,000 feet of 6-inch water mains will be laid at once.

Minneapolis, Minn.—(Special.)—The laying of 27,792 feet of 6-inch water mains is contemplated.

Columbus, Wis.—Plans and specifications are being prepared for a water and light system.

Fulton, N. Y.—The question of purchasing the existing water works system will be voted on soon.

Mt. Clemens, Mich.—Plans are being prepared for a big main 2½ miles long and a new pumping station.

Traverse City, Mich.—Council has voted that it is expedient to establish a water works system.

Battle Creek, Mich.—(Special.)—E. U. Hunt, cy. engr., says 7,000 feet of 6 and 8-inch water mains will be laid.

Gold Hill, Ore.—Bids will probably be received about May 15 for building water works. W. A. Carter, town rec.

LaCrosse, Wis.—(Special.)—Frank Powell, cy. engr., says that 4,000 feet of 6 and 8-inch water mains will be laid this season.

Newport, Ky.—(Special.)—W. L. Glazier, cy. engr., says that 1,200 feet of 10-inch water main extensions to Brighton is contemplated.

Topeka, Kas.—(Special.)—Wm. H. Barnes, cy. engr., says that plans will be made for a new water works system to cost about $440,000.

Altoona, Pa.—(Special.)—Harvey Linton, cy. engr., says that 6,000 lineal feet of 24 to 8-inch water mains will be laid during 1899.

Asheville, N. C.—(Special.)—B. M. Lee, cy. engr., says that 2,700 feet of 6-inch and 1,500 feet of 4-inch water mains will be laid.

Clinton, Ia.—(Special.)—Charles P. Chase, cy. engr., says that some water main improvements are contemplated.

Springfiled, Mo.—(Special.)—T. White, cy. engr., says about 10 mls. of water mains will be laid. Address Springfield Water company.

The question of issuing water works bonds will be voted on at the following places: Punxsutawney, Pa., May 23; Napoleon, O., May 15.

Austin, Minn.—The question of a water supply that will be fully adequate to the needs of the city for many years is being discussed.

Bloomington, Ind. — (Special.) — George Champe, cy. engr., says that 20,000 ft. of 12-10-8-6-in. water mains will be laid at a cost of $4,000.

Bay City, Mich.—(Special.)—Geo. Turner, cy. engr., says that a new water plant is contemplated for West Bay City, Mich., at a cost of $200,000.

Cape Vincent, N. Y.—The question of appropriating $3,000 for an additional boiler and pump for the water works system has been favorably voted on.

Des Moines, Ia.—Extensive improvements to the water works system are contemplated, including new filtering galleries and additional pumping machinery.

The construction of water works systems is contemplated at the following places: Milnor, N. D.; Gold Hill, Ore.; Solon, Ia.; Petersburg, La.; Glassboro, N. J.

Hamilton, Ont., Canada.—The city engineer is having plans prepared for experimental filters.

Laporte, Ind.—The city council rejected all bids for constructing the new water works system. Threatened action in the courts to secure an injunction led to the rejection, it is stated.

The question of issuing bonds has been favorably voted on as follows: Deadwood, S. D.; Pomeroy, La.; Spearfish, S. D.; Thompson, Ia.; Sibley, Ia.; Blooming Prairie, Minn.; Elkpoint, S. D.; Benton, Wis.; Ruthven, La.

Marshalltown, Ia.—The water works committee has been authorized to negotiate with an engineer, secure information and take such steps as it deems advisable toward securing an additional pure water supply.

Salt Lake City, Utah.—The council unanimously voted to adopt the report of the water works committee relative to improving the city's water supply. The estimated cost of the improvements is $32,143.22.

Oregon City, Ore.—The commissioners have found that the fall of Clackamas river is not sufficiffient to bring a supply to the pumping station without going too far up the river and they will endeavor to find another source of water supply. T. L. Charman, chrmn.

Philadelphia, Pa.—Bids will be asked for plans and specifications for the construction of a new pumping station with sedimentation basins and filtering beds, having a capacity of not less than 1...,000,000 gals. a day on the Delaware river above Lardner's Point; estimated cost, $600,000.

Grand Rapids, Mich.—The drinking water commission decided April 11 to employ two expert water works engineers to make recommendations regarding the best source of a pure water supply.

Anderson, Ind.—The water works commissioners have been authorized to extend the water mains through Shadeland and a committee of three has been appointed to confer with the water works commissioners regarding the question of acquiring pure water. Messrs. Kirkham, Woolley and Stanton, com.

Newly incorporated companies: Tupper Lake Water company, Tupper Lake, N. Y.; Massena Water company, Massena, N. Y.; Albany Water and Light company, Albany, Ind.; Duquoin Water Works company, East St. Louis, Ill.; Sealy Water Supply company, Sealy, Tex.; Valle Verde Water company, Valley Verde,Cal.; Seneca Springs Water company, Bordon, N. Y.; Point Concord Water company, Havre De Grace, Md.

St. Charles, Mo.—(Special.)—H. C. Sandfort, cy. clk., says a proposition to grant the St. Charles Water and Improvement company, now operating in this city, a new 20-year contract was rejected at a special election held for that purpose on the 15th inst. by a vote of 283 for granting a new contract and 709 votes against granting a new contract. It required a two-thirds majority "for" of the total vote polled to make the ordinance providing for a supply of water effective. The old contract of the Water company will expire in 1901. The probabilities are that a new proposition will be submitted to a vote of the people in the near future.

CONTRACTS TO BE LET

Laurel, Del.—Bids are asked until May 3 for a water and sewage plant. E. B. Riggen.

Belgrade, Minn.—Bids are asked until May 5 for building a water works system. F. W. Lenz, vil. rec.

Gallatin, Tenn.—Bids are asked until May 15 for building a water works system. E. O. Buchanan, secy. w. w. com.

Mayville, N. D.—Bids are asked until May 3 for the construction of water works. A. L. Nichols, secy. Winchester Water company.

Wellsville, O.—Bids are asked until May 15 for laying about 205 tons of 12-in. water pipe and 6 tons of 8-in. pipe and castings. D. A. Davidson, supt. w. w.

Ottawa, Ont., Canada.—Bids are asked until May 16 for furnishing and erecting the necessary water turbines and pumps for water works. John Galt, cy. engr.

Norristown, N. J.—Bids are asked until May 4 for putting an asphalt coated concrete lining in the new reservoir at the Morris Plains State Hospital. Robt. C. Walsh, arch.

Chicago, Ill.—Bids will be received until May 16 for six internally fired horizontal return tubular boilers, fitted with automatic stokers, and all necessary appurtenances, at the Chicago-ave. pumping station. L. E. McGann, comr. p. w.

CONTRACTS AWARDED.

Windsor, N. Y.—The contract for constructing water works was awarded to Col. M. B. Birdseye of Fayetteville, N. Y.

Winnipeg, Man.—John McDougall, Montreal, was awarded the contract, April 3, for two pumping engines of 5,000,000 gals. capacity each for $89,080.

Winnipeg, Man.—(Special.)—The contract for furnishing 2,310 water meters was awarded to George Irving, representing the National Meter Co. of Chicago, Ill.

Chicago, Ill.—The lowest bid received for water pipe was $23.48 a ton, an advance of 30 per cent. over the bids last year. Commissioner McGann decided to reject the bids.

Newark, N. J.—The board of works has let a contract for an auxiliary water supply from driven wells at Belleville to provide for the periods of greatest consumption in midsummer and midwinter. The contract was awarded to A. J. Connolly for $30,975. The city council will also draw up a contract with the East Jersey Water company to take and pay for all water to be furnished in such quantity as it may need, but not to exceed 10,000,000 gals. in any one day at $36 per million gallons.

BRIDGES.

Easton, Pa.—A bridge to cost $15,000 is contemplated.

Seymour, Wis.—This town voted to build an iron bridge across Buck creek. Mayor Foote.

Central City, Ia.—The proposed new bridge east of Paris is almost assured. Co. supvrs.

Salem, Ind.—The building of a bridge across Blue river, at E. Market-st., is contemplated.

Preston, Minn.—The erection of two iron bridges in Amherst township is contemplated by the county board.

Denison, Tex.—The city engineer is communicating with bridge companies preparatory to building a viaduct.

Springfield, O.—This city will issue $3,000 bonds for building bridges. Philip Huonker, cy. clk.

Biloxi, Miss.—Bonds have been voted for a bridge over the back bay. H. T. Howard, mayor.

Dayton, Tenn.—The county court has ordered a bridge over Little Richland creek.

Toledo, O.—A new bridge is being planed to replace the one over Swan creek at Lafayette-st. City Engineer.

Hamilton, O.—Plans and specifications have been filed with L. A. Dillon, Engr., for a number of truss bridges.

Nevada, Ia.—The board of supervisors contemplates the erection of a new iron bridge over the creek west of this city.

Norrristown, Pa.—Bids are asked until May 17 for a bridge over Saw Mill run at Airy-st. Co. comrs.

Omaha, Neb.—Bids will be asked at once for the new Sixteenth-st. viaduct. Andrew Rosewater, cy. engr.

Columbus, O.—Plans are being prepared for a new bridge across Big Walnut creek at Hibernia. Co. engr.

Binghamton, N. Y.—Bids are asked until May 9 for a bridge across the Susquehanna river at Tompkins-st. S. D. Kane, cy. clk.

McConnellsville, O.—Bonds have been voted to build a bridge across the Muskingum river. Geo. Birch, clk.

Aberdeen, S. D.—Sealed bids will be received until May 24 for the construction of five steel bridges. Chas. Eygabrood, co. audt.

Wrightstown, Wis.—Plans have been made and a contract will probably be let in May for the proposed Apple Creek bridge. C. J. Pope, town clk.

London, O.—Bids will be received until May 11 for building a bridge across Deer Park on the London and California pike. Co. audt.

Cleveland, O.—The park engineer has been instructed to advertise for bids for two bridges on the new lower boulevard in the eastern park system.

South Bend, Ind.—The county commissioners have decided to build a new bridge over the St. Joseph river at Jefferson-st. The present bridge will probably be removed to Sample-st.

PARKS.

St. Paul, Minn.—A resolution has been passed by the park board to lay out a park at Lake Phalen.

Minneapolis, Minn.—The park commissioners have secured Warren H. Manning of Boston to prepare plans for laying out Lyndale Park, north of Lake Harriet.

Grand Rapids, Mich.—The plans submitted by W. L. Cukerski, superintendent of parks, for park improvements have been approved; estimated cost, $25,000.

Camden, N. J.—The board of health has requested the council to take action looking to the filling in of the meadowland on Broadway, from Mechanic to Jackson-st., where it is proposed to locate the downtown park.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Camden, N. J.—The Camden Reduction company has filed articles of incorporation.

Glens Falls, N. Y.—The purchase of a street sweeper is contemplated. D. J. Finch, st. comr.

Cohoes, N. Y.—The question of acquiring better methods of garbage disposal is being considered.

Chester, Pa.—Preliminary plans have been prepared for an incinerating plant for disposal of garbage.

New York City.—Bids are asked until May 2 for steel dumping carts. Francis J. Lantry, com. of correction.

Lexington, Ky.—The mayor has been authorized to advertise for bids for street cleaning for a period of two years.

Sydney, Australia.—Bids will be asked soon for a garbage crematory. Dr. Asburton Thomson, prest. bd. of health.

Sacramento, Cal.—The city officials desire to correspond with firms manufacturing garbage plants. Bids will probably be asked soon.

Jersey City, N. J.—The Town Improvement Committee, composed of ladies, has been organized to see that the streets are kept clean.

Lowell, Mass.—The Lowell Garbage and Cremation company was awarded the contract for collection and disposal of swill, garbage, offal, ashes, etc., at $26,500 per year for five years.

New York City.—The municipal court passed a resolution April 18 providing for an appropriation of $569,000 for the purchase of an additional plant for the street cleaning department in all boroughs.

Washington, D. C.—Contracts were awarded April 10 for street cleaning as follows: Machine sweeping, Lilly & Robinson, Indianapolis, Ind., 19 cts. per 1,000 sq. yards, for 1, 2 or 3 years; cleaning paved alleys, Daggett & Dugan, Washington, 33 cts. per 1,000 sq. yards; hand cleaning, Daggett & Dugan, 21¼ cents for either term of years; cleaning unpaved streets and alleys, R. V. Rusk, Washington, $66.50 a day for one year; $66.25 a day for two years; $65.50 a day for three years.

Indianapolis, Ind.—Sprinkling contracts were awarded April 10 as fololws: F. Fuehring, dist. 9, $27.99 per 10,000 sq. ft.; H. Nolting, dist. 2, $26.95; dist. 3, $29.99; dist. 6, $25.80. J. F. Reeder, dist. 4, $24.85; F. Kennington, dist. 8, $24.90; dist. 10, $26.50; Rust & Roepke, dists. 11 and 12, $26.50 each; F. W. Nolting, dist. 13, $25.25; dist. 14, $25.40; dist. 16, $29.50; Geo. Danpert, dist. 7, $24; J. R. Kennington, dist. 15, $28.25; G. W. McCray, dist. 1, $22.95. The increase of the cost over last year is $6, but the board of public works believes that last year's prices were too low for profit.

Newton, Kas.—(Special.)—This city is having trouble to find a dumping ground for rubbish, and it is possible that a crematory may be built, and the old city water plant will be utilized for the purpose, as the building, smoke stack and furnaces are in such a condition that they could be used at any time. With an expenditure of $2,000 it is estimated that it could be transformed into a first-class crematory.

Louisville, Ky.—Bids were received for the construction of a garbage crematory as follows: Smead Crematory & Power company of Toledo, O., $58,000; cost of incineration, 22½ cts. a ton; Dixon Garbage Crematory company of Toledo, $60,000, $58,000 or $56,000; the cost per ton, 29 cts.; Engle Sanitary and Cremative company of Des Moines, $75,000; cost per ton is 35 cts.; American Sanitary Engineering company of Detroit, $119,000; cost 25 cts. a ton; Thackeray Incinerating, Fertilizing & Developing company of Cincinnati, to erect a furnace with a capacity of 250 tons a day for $59,650; to construct and operate a furnace for one year for $39,529, the city having the privilege to purchase within the year; to erect a furnace and charge an annual rental of $39,129.

STREET LIGHTING.

Mayville, N. D.—Bids are asked until May 2 for an electric light system. Samuel Forguson, co. audt.

Logansport, Ind.—The Logansport & Wabash Valley Gas company will begin supplying its patrons with acetylene gas May 1.

Cincinnati, O.—The question of lighting the city by the Welsbach incandescent burner is being considered by the light committee.

Winchester, Ind.—Bids will be received until May 3 for arc lighting. A. L. Nichols, secy. Winchester Water & Light Co.

Cleveland, O.—Bids are asked until May 10 for furnishing and maintaining about 2,200 70 c. p. incandescent lamps. George R. Warden, dir. P. W.

Midway, Ky.—Bids are asked until May 9 for a franchise for five years for constructing, maintaining and operating an electric light system. Matt Winn, mayor.

Pulaski, Va.—Plans will be prepared for an electric light plant of 50 2,000 c. p. arc and 500 16 c. p. incandescent lights. John T. Loving, mayor.

Nebraska City, Neb.—The sum of $15,000 has been appropriated by the Nebraska City Water & Light Co. for a new electric light plant. D. P. Rolfe, local mgr.

Montgomery, Ala.—The Montgomery Water Power & Electric Co. has filed articles of incorporation and will build a new electric light plant. J. S. Pinckard, prest.

Vincennes, Ind.—Sealed proposals will be received until May 22 for lighting the streets, alleys, parks, public buildings and public places, for 10 years, with 165 arc lamps and 175 gas lamps. Chas. Laugel, cy. clk.

Voted in favor of lighting plants: Fayetteville, N. C.; Princeton, Minn.; Winnipeg, Man.; Berea, O.; Mechanicsville, Ia.; Brooklyn, Ia.; Haddonfield, N. J.; Tarboro, N. C.; Brookings, S. D.; Austin, Minn.; Monroe, Mich.

Florence, Ala.—Bids will be received until May 2 for 50 electric street lamps, 2,000 c. p., lamp to burn all night, moonlight schedule; also 100 gas lights with and without Welsbach street burners. John B. Weakley, jr., mayor.

Washington, D. C.—Bids will be asked until May 13 for lighting the streets and roads in the District of Columbia during the year ending June 30, 1900, with naphtha lamps and furnishing 2,000 street lamps. John B. Wight, chrmn. dist. comrs.

Contemplated plants: Williamstown, Pa.; Linnens, Mo.; Waupun, Wis.; Dyer, Tenn.; Toledo, Ia.; Stephen, Minn.; Two Harbors, Minn.; Williamsburg, Ia.; McKenzie, Tenn.; Sturgeon, Mo.; Blissfield, Mich.; Versailles, O.; Cartersville, Ga.; Washington, Ga.; Harrodsburg, Ky.; White Cloud, Mich.; Tucson, Ariz.